BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1927

ROYAL BOTANIC GARDENS, KEW

I.—THE FALKLAND ISLANDS.

The afforestation of the Falkland Islands, the earlier account of which was given in *Kew Bulletin* 1919, pages 209–217, has been the subject of further experiments since the appointment of Mr. James Reid as forester in 1920. Introductions have been attempted with seedlings and seeds from England and Scotland, with plants from South America and the Scilly Isles and with seeds from New Zealand and other sources

From these experiments it is clear that the most hopeful results are to be expected from trees raised from seed sown in the Islands.

The Conifers and other trees which had been imported as seedlings and planted at Mt. Low, East Falklands, in 1920, survived the first few years, the Sycamores remained 4 inches high, the Alders and Mountain Ash reached a height of 2 feet. In 1923, however, the severe storms of wind and snow proved fatal to them and they have gradually died out.

Several species of Conifers have been tried with varying success, Scots Pine attaining a height of 12 inches, Corsican Pine 12 inches, Sitka Spruce 9 inches, Austrian Pine 2 feet, Norway Spruce 6 inches, Maritime Pine 8 inches, and *Pinus insignis* 14 inches. Most of these died soon after they were planted out; some Corsican Pine have survived but have made little new growth, whilst the Scots Pine and Sitka Spruce raised from locally-sown seed have made strong short growths and an abundance of fibrous roots.

In 1923 young seedlings of *Nothofagus antarctica* 2 to 2½ feet high, and *N. obliqua* 12 to 16 inches high, were obtained from Punta Arenas. They were placed in a nursery with seedlings of *Alnus incana* 6 inches, Willows 4½ to 5 feet, and *Pyrus Sorbus* 18 to 20 inches high, all of which promised well, although the *Nothofagus* had arrived with roots in a damaged condition. The *Nothofagus antarctica* has given encouraging results and is even more successful than *N. obliqua*.

The introduced broad-leaved species have not done so well. All the Sycamore, Alder and Mountain Ash plants introduced from England and planted at Mt. Low in 1920 eventually succumbed. The Poplars, 13 to 15 feet high, at Kent Paddock, Hill Cove, West Falklands, planted by Mr. Blake thirty years ago (*K.B.* 1919, p. 214) have thrown up suckers freely. From these some 600 transplants up to 6 feet high have been successfully established

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there under the protection of the gorse hedge, which is from 6 to 8 feet in height.

Seeds of various species received from New Zealand did not prove satisfactory, the only ones germinating being *Pinus insignis* and *Pittosporum crassifolium*. A consignment of New Zealand plants brought by H.E. The Governor from the Scilly Isles in 1924 proved more successful. They included *Olearia Traversii*, *O. semidentata*, *Brachyglottis repanda*, *Escallonia rubra*, *E macrantha*, *Pittosporum crassifolium*, *Coryncocarpus laevigatus*, *Metrosideros robustus*, *Coprosma Bruniana*, species of *Myoporum* and *Veronica*. They were started into growth in boxes and later put out in the nursery beds, where the *Escallonia* flowered. Subsequently they were planted out under shelter of a hedge at Hill Cove and at first did well. In June, 1925, however, they were severely checked by frost and their woody stems damaged.

The general results of these experiments have led to the decision to abandon any further attempts at afforestation at Mt. Low, East Falklands, and to concentrate for the time on Hill Cove, West Falklands, where there is better soil and more sheltered conditions, especially by the gorse hedges. This, however, will be no easy task, for it involves transporting the seedlings raised at Port Stanley 130 miles by sea to Hill Cove.

Mr. Blake has placed the paddock at Hill Cove, an area of 10 acres, at the disposal of the Government, and has rendered every assistance to the scheme in the difficult and expensive task of preparing seed beds and land ready for planting.

Here in the autumn of 1925 ground was prepared for planting. Ditches were cut at 15 yards interval and led into a natural stream which flows through the middle of the paddock. Holes were prepared 3 feet apart, turf being removed and the soil and clay broken up to a depth of 14 inches. In several cases the moor pan was found to be only some four inches below the ground surface and this necessitated breaking up with crowbars and pickaxes. Six acres so prepared have already been planted out with 30,000 conifers of which the Scots Pine and Sitka Spruce give promising results. All the trees planted were raised at Port Stanley except 1,000 Scots Pine which were raised at Hill Cove, West Falklands. The nursery at Government House, Port Stanley, has been stocked with 40,000 seedlings, part of which it is proposed to plant out at Hill Cove next spring and the remainder in the following year.

Tumping was tried when planting out, but this system proved a failure, as during the winter months the soil was reduced to a powder and in spring the high winds carried it away and left the dry grass roots exposed. The cultivating-iron and wedge-shaped spade proved the most suitable tools, but an ordinary garden spade was used when the roots were too large for the wedge.

It is interesting to note that the New Zealand Flax (*Phormium tenax*) imported in 1920 has now become fairly well established

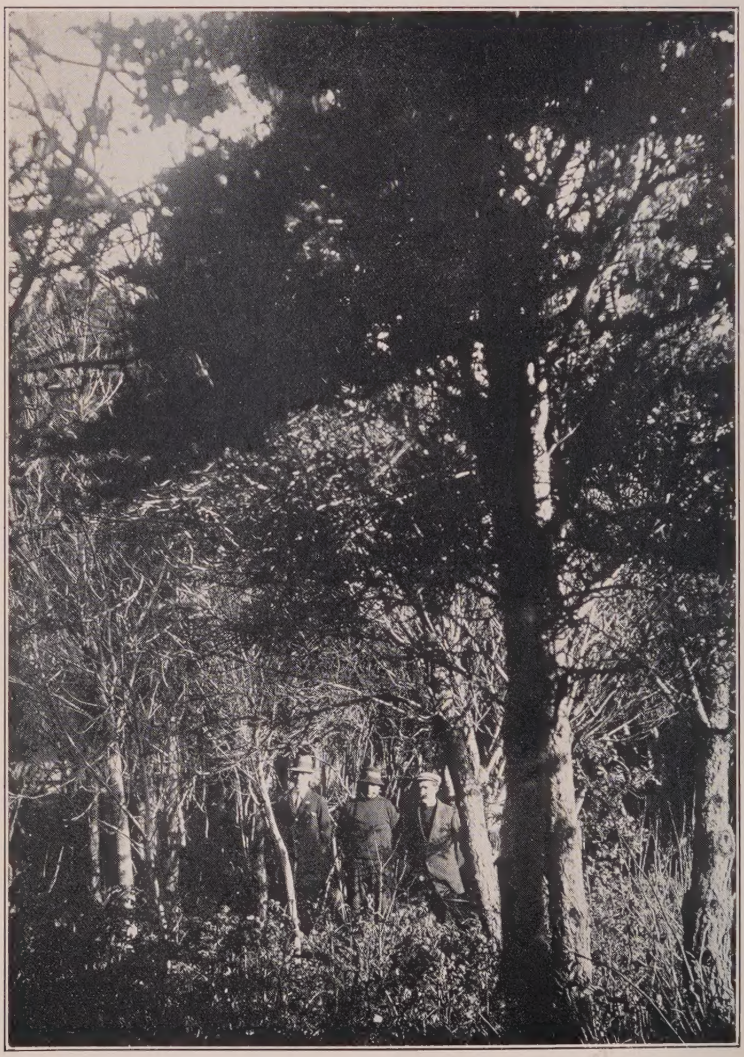
PLATE II.

The old plantation, Hill Cove, from the north-west.
Nothofagus antarctica in centre.

The old plantation, Hill Cove, showing Scots Pine and *Nothofagus antarctica* to right of picture.

[*To face page 2.*

PLATE III.



In the old plantation, Hill Cove, West Falklands. Scots Pines and Poplars.

To face page 3.]

and the average height is 3 feet 6 inches. Only two plants survived from a sowing of seed and they measure 2 feet 6 inches. The plants are well sheltered and are growing on a fairly dry bank of red clay mixed with loam.

Throughout the whole period of these afforestation experiments there has been a low rainfall with strong winds in the spring, and excessive moisture when the trees were dormant.

The results so far obtained, both negative and positive, are a distinct advance in the problems connected with afforestation in these Islands. It is to be hoped that the work initiated during Mr. Reid's term of office will be continued, as there is a good indication now that so many of the difficulties have been appreciated that a certain measure of success will be obtained.

We are indebted to the late Governor, Sir John Middleton, K.B.E., C.M.G., for the accompanying illustrations.

II.—ON THE FLORA OF THE NEARER EAST: III.*

A. R. Horwood and W. B. Turrill.

A Collection made by the Rt. Hon. Sir Ronald C. Lindsay, G.C.M.G., C.B., C.V.O., near Angora.

Since the completion of Boissier's Flora Orientalis† very considerable botanical collections have been made in the Nearer East. Many German botanists have collected in Asia Minor, and the richness of the flora, especially in herbaceous and suffruticose plants, is indicated by the large numbers of new species described by Bornmuller, Haussknecht, and other systematists. The phytogeographical importance of Asia Minor to students of the Mediterranean and Central European floras can scarcely be overestimated. Evidence is accumulating that many genera have their headquarters in the Nearer East, from whence species have radiated westwards, spreading through the Mediterranean Basin and even northwards in Western Europe, and also across the Balkan Peninsula into Central Europe. Fortunately Kew possesses excellent sets of many of both the older and the more recent collections from Asia Minor, and our material from the Mediterranean Region as a whole probably forms the best collection in existence in any single institution.

The Rt. Hon. Sir Ronald C. Lindsay, G.C.M.G., lately H.B.M. Ambassador to the Republic of Turkey (now H.B.M. Ambassador to Berlin) has presented to Kew a set of 87 well-dried plant specimens collected in the neighbourhood of Angora in 1926. Useful field-notes accompanied the plants, most of which have been definitely determined, though a few which are not fruiting have to remain

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* Continued from *K.B.* 1926, p. 380.

† Vol. V. was published in 1884, and the Supplementum in 1888.

without a trivial. Two new species occur in the collection, and these have been described as *Vicia anatolica* and *Ruta lindsayi*. It has been considered advisable to publish an annotated list of the whole collection in the hope that others visiting the Nearer East will contribute specimens to Kew.

Sir Ronald has kindly supplied the following particulars:—

"1, Holland Park, W.11.

"The collection of plants, of which a list is given below, was made in a rather haphazard manner between April 15th and June 7th, at Angora, the new capital of Turkey. The collector does not claim to be a botanist—indeed he has little more than a bowing acquaintance with the commoner English flowers; but the finding and preservation of the plants afforded him agreeable relaxation in the intervals of exacting official business, and it will be a great satisfaction to him if the collection proves to be of some slight interest to serious scientists.

"The climate of Angora is typically continental. Winter is intensely cold in general, but thaws supervene periodically and turn the whole country into a sea of mud. April is usually a dry month, but in May there are heavy storms of rain. From June to September the heat is torrid and everything dries up. Autumn is the finest season of the year, with bright sunny days and frosty nights. There are no meteorological records.

"The country round Angora is completely bare. Not a tree is to be seen over a vast expanse except in straggling orchards on the hills and in some valley-bottoms. There is no scrub. The plants enumerated here were all gathered in the neighbourhood of Chankaya, about 4 miles south of Angora, at an elevation of from 2,800 to 3,300 feet above the sea level, where the soil is a decomposed volcanic rock. Vegetation is the reverse of luxurious and there are few annual plants. Aromatic herbs of all kinds are the most abundant.

"The collection would have been less incomplete if a rain storm had not come through the roof and ruined a number of specimens.

"R. C. Lindsay."

Systematic List and Notes.

Adonis sp. Angora: Chankaya, April and May, scarlet flowers with a black centre, No. 20.

Delphinium orientale *Gay* in Des Moulins Catal. Dord. 12 (1840).
Angora: Chankaya, 15th-31st May, 2 feet high with purple flowers, fairly common, No. 64.
Distr. Medit. Region.

Berberis crataegina *DC.* Syst. ii. 9 (1821).
Angora: Chankaya, 6th May, thorny bush 6 feet high, with yellow flowers, No. 19.
Distr. Asia Minor, Armenia, N. Persia.

Glaucium flavum *Crantz* Stirp. Austr. ed. 1. ii. 133 (1763) sensu lato.
Angora: Chankaya, 25th May, scarlet flowers with no black blotch at the base of the petals, only two plants found, No. 55; scarce at Angora, May 15th-30th, apricot-yellow, 18 inches high, No. 56; Chankaya, May, scarlet flowers, fading tawny, with small black blotch at the base of each petal, No. 53.

Three colour varieties are represented in the collection. Possibly they may be referable to *G. leiocarpum* Boiss., but without field studies and breeding experiments on the group we are unable to decide if this is really distinct specifically from *G. flavum* Crantz. None of the Angora specimens has mature fruits.
Distr. (of species). Medit. Region and Cent. Europe.

G. grandiflorum *Boiss. et Huet* Diagn. ii. v. 15 (1856).
Angora: Chankaya, May, scarlet petals each with a large black blotch, No. 54.
Distr. Asia Minor to Persia.

Hypecoum grandiflorum *Benth.* Catal. Pyr. 91 (1826).
Angora: May, a small straggling plant with rather heart-shaped yellow flowers, common everywhere on lower ground, but not too common at 1,000 m. No. 70.
Distr. S. Europe and Orient.

Alyssum campestre *L.* Sp. pl. ed. 2. ii. 909 (1763).
Angora: Chankaya, April and May, a small woolly herbaceous plant, with yellow flowers, common in rocky places, No. 14. In the absence of fruit the determination is somewhat tentative.
Distr. Cent. and S. Europe, Asia Minor to Armenia, Syria.

A. desertorum *Stapf* in Denkschr. Akad. Wien li. 302 (1886).
Angora: Chankaya, April-May, a herbaceous, hard, tough plant with yellow flowers, common in rocky places, No. 12.
Distr. E. N. Temp. Region.

Barbarea plantaginea *DC.* Syst. ii. 208 (1821).
Angora: Dikmen Brook, 16th-30th April, a tall coarse plant with yellow flowers in large heads, No. 9.
Distr. Asia Minor, Syria, Armenia, N. Persia.

Crambe tatarica *Sebeók.* Diss. inaug. de Tataria hungarica 7, cum tabula (1779) *sec.* Simonkai Enum. Flor. Transsilv. 103 (1886).
Angora: very common in the lower plains, but not many on high ground, 15th-30th May, a bush 2 feet high, probably a biennial, with large very deeply cut leaves, and many small white flowers in large inflorescences, No. 37.

Hesperis pendula *DC.* Syst. ii, 457 (1821).
Angora: Chankaya, 16th-30th April, a fairly common sticky plant with brownish and sweet-scented flowers, No. 8.
Distr. Asia Minor, Armenia, Syria.

Isatis glauca *Auch.* ex Boiss. in Ann. Sci. Nat. Ser. 2, xvii. 201 (1842).
Angora: Embassy Garden, 5th June, a handsome plant 2 feet high, with yellow flowers, No. 72. In the absence of fruit we are not quite sure of the determination.
Distr. Asia Minor, Armenia, N. Persia.

Lepidium perfoliatum *L.* Sp. Pl. 643 (1753).
Angora: Chankaya, April-May, a tall plant with yellow flowers, No. 2.
Distr. E.N. Temp. Region.

L. draba *L.* Sp. Pl. 647 (1753).
Angora: Chankaya, May, a tall coarse ubiquitous weed with large heads of very small white flowers, No. 29.
Distr. Medit. Region.

Matthiola oxyceras *DC.* Syst. ii. 173 (1821).
Angora: Chankaya, 1st-15th May, a common straggly plant, with woolly silvery leaves and yellow to pink flowers, No. 21.
Distr. Asia Minor to Caucasus, Irak and Arabia.

Saponaria prostrata *Willd.* Enum. 465 (1809).
Angora: Chankaya, May, No. 45.
The specimen represents a *forma foemina*, in which the stamens are reduced to functionless vestiges and the petals have somewhat narrower and shorter laminae.
Distr. Asia Minor and Armenia.

Silene densiflora *d'Urv.* Enum. 47 (1822).
Angora: Chankaya, 15th-30th May, a sticky plant, with very small yellow flowers, in close bunches at the nodes of an erect stem up to 2 feet high, common, No. 50.
Distr. Balkan Peninsula, Crimea, Caucasus, Asia Minor.

Hypericum avicullariaefolium *Jaub. et Spach*, Pl. Or. i. 59, t. 30 (1842-43).
Angora: Chankaya, 15th-20th May, a fairly common, small, bushy plant 6-8 inches high with glaucous leaves, No. 77.
Distr. Asia Minor.

H. hyssopifolium *Vill.* Hist. Dauph. iii. 505, t. 44 (1809).
Angora: Dikmen Valley, 31st May, 1 foot high with handsome pyramidal inflorescences, not too common, No. 76.
In the broader inflorescence this agrees with the var. *lydium* Boiss., in the shape of the sepals with the var. *elongatum*, Boiss.
Distr. Medit. Region to Cent. Asia.

H. scabrum *L.* Cent. i. 25 (1755).
Angora: Chankaya, May, 10 inches high, common, No. 30.
Distr. Asia Minor to Cent. Asia.

Linum anatolicum *Boiss.* Diagn. 1. i. 56 (1842).
Angora: Chankaya, 15th-30th May, a plant with straggling stems and of a silvery appearance, 8 to 10 inches high, pale lilac flowers, common, No. 58.
Distr. Asia Minor.

L. balansae *Boiss.* sensu Freyn in Bull. Herb. Boiss. iii. 101 (1895) et Bornm. in Verhl. Zool.-Bot. Ges. xlviii. 567(1898). *Linum mucronatum* Bert. var. *latifolium* Freyn in Oest. Bot. Zeitschr. xl. 211 (1890), nomen solum.
Angora: Chankaya, 15th-31st May, a bright and pretty plant, 10 inches to 1 foot high, with spreading branches and yellow flowers, No. 67.
Distr. Asia Minor.

Ruta lindsayi *Turrill* sp. nov.: ab *R. cilicica* (Boiss. sub *Haplophyllum*) Turrill comb. nov. pedicellis longioribus ovarii gibbis multo majoribus distinguitur.

Herba perennis, basi suffruticosa, caulibus basi ascendentibus deinde erectis simplicibus molliter breviterque pubescentibus omnino foliosis teretibus. *Folia* caulina anguste elliptico-lanceolata vel oblanceolata, apice acuta, basi leviter angustata, sessilia, 1-2 cm. longa, 2-4 mm. lata, sparsim breviter pubescentia. *Corymbus* subdensus, pedicellis 5-7 mm. longis albo-pubescentibus; bracteae late ovatae, acutae, albo-pubescentes, et ciliatae, breviter pedicellatae, inferiores, 1 cm. longae, 6 mm. latae. *Sepala* late oblata, obtusa, 2·5 mm. longa, 3·5 mm. lata, longe albo-pubescentia et ciliata. *Petala* latissime ovata, vix carinata, apice rotundata, 8 mm. longa, 7 mm. lata, glabra, siccitate luteo-aurea. *Stamina* 10, filamentis lanceolato-subulatis apice gradatim acuminatis fere 5 mm. longis basi 1 mm. latis inferne barbatis, antheris oblongis 2 mm. longis. *Ovarium* glabrum, apice gibbis ovoideis loculis majoribus 1·5 mm. longis instructum, loculis quadriovulatis; stylus 5 mm. longus.

Anatolia: Angora, near "Five Trees," 2nd June, *Lindsay* 85.

The collector refers to this as a rather handsome plant, about 9 inches high, with the yellow flowers in close flat-topped heads. Only a few plants were seen.

Those who wish to keep up the genus *Haplophyllum* can refer to the plant as *H. lindsayi* Turrill, or if it is preferred to drop the aspirate to *Aplophyllum lindsayi* Turrill.

Rhamnus petiolaris *Boiss.* Diagn. II. v. 75 (1856).
Angora: Chankaya, May, common, No. 78. The specimens have smaller leaves than usual.
Distr. Asia Minor to Armenia and N. Syria.

R. petiolaris *Boiss.* var. *velutina Boiss.* Fl. Or. ii. 18 (1872).
Angora: Chankaya, May, No. 79.
Distr. Asia Minor.

Astragalus melanophrurius *Boiss.*? Fl. Or. ii. 276 (1872).
Angora: Chankaya, 1st-20th May, a woolly plant, 1-2 feet high, with yellow flowers, common in lower ground, No. 22.
Distr. Asia Minor.

Hedysarum varium *Willd.* Sp. Pl. III. ii. 1206 (1803), sensu Boiss. Fl. Or. ii. 518 (1872).
Angora: Chankaya, 25th May, yellow flowers, No. 48.
Distr. Gallipoli Peninsula to Irak.

Lathyrus sphaericus *Retz* Obs. iii. 39 (1783).
Angora: Chankaya, 15th May, flowers brick red, No. 28.
Distr. Medit. Region.

Pisum elatius *M.B.* Flor. Taur.-Cauc. ii. 151 (1808).
Angora: Chankaya, 15th-30th May, standard white or pale blue, keel dark blue. Nos. 59, 60.
Distr. Medit. Region.

Vicia anatolica *Turrill* sp. nov.: ab *V. hybrida* L. foliis angustioribus et floribus vexillo praecipue minoribus, ab *V. lutea* L. vexillo adpresse sericeo distinguitur.

Planta annua, usque ad 2·5 dm. alta. *Caules* 3–4 scandentes vel prostrati, longitudinaliter sulcati, leviter adpresse hirsuto-pubescentes. *Folia* hirsuta, inferiora haud cirrhifera, 4–6-juga, foliolis obovatis vel elongato-obovatis apice saepe valde retusis basi angustatis vel petiolulo brevissimo praeditis 5–6 mm. longis circiter 3 mm. latis; superiora cirrhifera 6–8 cm. longa 7–8 juga, foliolis linearibus apice tridentatis vel truncato-apiculatis basi petiolulo 0·5–0·75 mm. longo instructis usque ad 2 cm. longis 1·5 mm. latis. *Flores* axillares, solitarii vel bini, pedicellis 1–2 mm. longis suffulti. *Calyx* flavo-viridis, hirsutus, ore obliquo, tubo 5 mm. longo, laciniis lanceolato-subulatis acuminatis 2–2·5 mm. longis superioribus brevioribus. *Vexillum* oblongum, apice truncatum, basi angustatum, 1·7 cm. longum, 8 mm. latum, dorso hirsutum. *Alae* 1·5 cm. longae, lamina 3 mm. lata. *Carina* 1·3 cm. longa, *Legumen* immaturum deflexum vel subdeflexum, compressum, apice basique angustatum, 3 cm. longum, 8 mm. latum, adpresso-sericeum.
Anatolia: Angora district: Chankaya, yellow flowers, May 10th-20th, common, *Lindsay* 51.

The specimens here described have not been matched at Kew or the Natural History Museum, nor do they agree with any of the published descriptions of new species from the Orient in their combinations of characters. The vexillum is hairy on the back as in *V. pannonica* Jacq. and *V. hybrida* L. The colour of the flowers resembles, so far as one can judge from dried material, that

of *V. melanops* S. et S., but the vexillum is shorter, straighter, and more regularly oblong.

Amygdalus orientalis *Ait.* Hort. Kew ii. 161 (1789).
Angora: Chankaya, 15th April, masses of mauve-purple flowers, leaves and fruit woolly and silvery, common, Nos. 80, 81.
Distr. Asia Minor to Armenia and Syria.

Rosa canina *L.* Sp. Pl. 491 (1753) var. **collina** *Boiss.* Fl. Or. ii. 685 (1872).
Angora: Inja Su, 28th May, rose-white flowers, No. 62.

R. canina *L.* var. **vulgaris** *Koch* sensu Boiss. Fl. Or. ii. 685 (1872).
Angora: Chankaya, 15th-31st May, rose-pink flowers, No. 47.
Distr. (of sp.). Europe east to Persia.

R. sulphurea *Ait.* Hort. Kew ii. 201 (1789).
Angora: Chankaya, 1st–20th May, a very handsome bush with numerous yellow flowers, common, No. 27.
Distr. Asia Minor to Transcaspia.

Artedia squamata *L.* Sp. Pl. 242 (1753).
Angora: Chankaya, 31st May, a common plant 2 feet high, No. 86.
Distr. Asia Minor to Irak and Palestine.

Scandix iberica *M.B.* Flor. Taur.-Cauc. i. 425 (1808) et iii. 236 (1819).
Angora: Chankaya, 16th–30th April, small white flowers, No. 3.
Distr. Asia Minor to Persia.

Asperula arvensis *L.* Sp. Pl. 103 (1753).
Angora: Chankaya, 15th May, small blue flowers, common, No. 23.
Distr. Europe and Medit. Region.

Galium coronatum *S. et S.* Prodr. Fl. Graec. i. 90 (1806), et Fl. Gr. t. 125, sensu Boiss. Fl. Or. iii. 79 (1875).
Angora: Chankaya, April and May, with tough root and yellow axillary flowers, very common, No. 4.
Distr. Greece to Persia and Syria.

Valeriana tuberosa *L.* Sp. Pl. 33 (1753).
Angora: on Dikmen Hill, 20th April, pinkish-mauve flowers, not very common, No. 16.
Distr. E.N. Temp. Region.

Asyneuma lobelioides *Hand.-Mazz.* in Ann. Hofmus. Wien. xxvii. 431 (1913).
Angora: Chankaya, 31st May, small pale blue flowers, sessile on straight spiky branches, Nos. 84, 84a.
Distr. Asia Minor.

Campanula lyrata *Lamk.* Encycl. Meth. i. 588 (1783).
Angora: Chankaya, 15th–30th May, tall erect plant with hard woody stem and root and blue flowers, common, No. 33.
Distr. Gallipoli Peninsula, Asia Minor to Caucasus.

Anagallis foemina *Mill.* Gard. Dict. ed. 8 (1768).
Angora: Embassy grounds, 15th–30th May, a prostrate plant with small bright blue flowers on long pedicels, No. 57.
Distr. Nearly cosmopolitan.

Lysimachia atropurpurea *L.* Sp. Pl. 147 (1753).
Angora: Dikmen brook-side, 15th–25th May, crimson flowers, No. 69.
Distr. Balkan Peninsula and Asia Minor.

Vinca herbacea *W. et K.* Pl. rar. Hung. i. 8, t. 9 (1802).
Angora: Chankaya, 15th April–15th May, contorted flowers of a strong blue colour, very common everywhere, No. 15.
Distr. S.E. Europe, Asia Minor to Palestine and Persia.

Alkanna orientalis *Boiss.* Diagn. i. iv. 46 (1844).
Angora: Bendi Dere, 16th–30th April, a tall coarse plant with small yellow flowers very attractive to bees, No. 10.
Distr. Greece, Asia Minor east to Persia, and south to Syria.

Anchusa italica *Retz.* Obs. i. 12 (1779).
Angora: Chankaya, 15th–31st May, common, No. 41.
Distr. S. and Cent. Europe, Asia Minor to Persia, Siberia, and N. Africa.

A. leptophylla *R. et S.* Syst. iv. 90 (1819).
Angora: Chankaya, 10th–30th May, 18 inches high, with bright blue particularly brilliant flowers, very common, No. 35.
Distr. Asia Minor, Armenia to Crimea.

Lappula barbata *Gürke* in Engl. u. Prantl. Pflanzenfam. iv. 3A. 107 (1893).
Angora: Chankaya, 25th May, on high dry ground, No. 44.
Distr. S.E. Europe to Persia and Siberia.

Moltkia aurea *Boiss.* Diagn. i. iv. 49 (1844).
Angora: Chankaya, 15th April–20th May, flowers yellow on a curving flower stem, very common, No. 26.
Distr. Asia Minor.

M. coerulea *Lehm.* in Neue Schr. naturf. Ges. Halle III. ii. 6 (1817).
Angora: Chankaya, April and May, rather small bright blue flowers, very common, No. 11.
Distr. Asia Minor, Syria.

Nonnea macrosperma *Boiss. et Heldr.* Diagn. i. xi. 97 (1849).
Angora: Chankaya, 15th–31st May, a coarse plant up to 1 foot high, small yellow flowers in large round head, common in low ground, scarce at higher elevations, No. 40.
Distr. Asia Minor to Armenia.

Paracaryum ancyritanum *Boiss.* Fl. Or. iv. 260 (1879).
Angora: Chankaya, May, drooping mauve flowers with big sepals, plant much larger in low ground, No. 24.
Distr. Asia Minor.

P. incanum *Boiss.* Fl. Or. iv. 262 (1879).
Angora: Chankaya, May, a coarse silvery plant 15 inches high with maroon to chocolate flowers, No. 73.
Distr. Asia Minor, Caucasus.

Linaria coridifolia *Desf.* Cor. Tourn. 32, t. 22 (1808), *modo* corifolia.
Angora: Chankaya, near "Five Trees" and elsewhere, 10th–30th May, 10 inches to 2 feet high, very small pale blue lilac flowers, Nos. 32, 39.
Distr. Asia Minor and Armenia.

Veronica multifida *L.* Sp. Pl. 13 (1753) var. **tenuifolia** *Boiss.* Fl. Or. iv. 442 (1879).
Angora: Chankaya, April and May, a straggly, hairy plant with pale blue flowers, very common, No. 1.
Distr. (of var.). Asia Minor to Caucasus and Crimea.

Hyoscyamus niger *L.*/ Sp. Pl. 179 (1753).
Angora: Chankaya, 15th–31st May, No. 82A.
Distr. E.N. Temp. Region.

H. reticulatus *L.* Sp. Pl. ed. 2. 257 (1762).
Angora: Chankaya, 15th–31st May, No. 82.
Distr. Gallipoli Peninsula, Asia Minor to Persia.

Orobanche anatolica *Boiss. et Reut.* in DC. Prodr. xi. 17 (1847).
Angora: Chankaya, 15th–30th May, only two specimens found, No. 61.
Distr. Asia Minor to Persia.

Acanthus hirsutus *Boiss.* Diagn. 1. iv. 85 (1844).
Angora: Chankaya, 10th–30th May, flowers creamy white, fairly common, No. 36.
Distr. Most of Asia Minor and Rhodes.

Globularia trichosantha *F. et M.* Ind. Sem. Hort. Petrop. v. 36 (1839).
Angora: Chankaya, 15th April–15th May, a herbaceous plant in thick clumps, globular heads of indigo-blue flowers, fairly common, No. 18.
Distr. Asia Minor, Armenia, Syria.

Ajuga chia *Schreb.* Unil. 25 (1774).
Angora: Chankaya, May, a low bushy plant, with yellow single flowers, very common, No. 74.
Distr. Balkan Peninsula to Persia and Syria.

Lallemantia iberica *F. et M.* Ind. Sem. Hort. Petrop. vi. 53 (1840).
Angora: Chankaya, 20th–30th May, 10 inches high with pale blue flowers in an erect head, No. 42.
Distr. Asia Minor to Persia and Palestine.

Marrubium pestalozzae *Boiss.* Diagn. II. iv. 53 (1859).
Angora: Chankaya 1st–15th May, a tall very woolly plant with small narrow leaves and small dirty white flowers, No. 31. The present young specimen differs from other collections *Balansa* 1182 (Ouchak, Phrygia) and *Bourgeau* 221 (Elmalu, Lycia), as now in Herb. Kew., in the more floccose indumentum and thinner more long-petiolated leaves. We disagree with the reduction of the species to *M. praecox* Janka.
Distr. Asia Minor.

Phlomis lanceolata *Boiss.* Diagn. I. v. 36 (1844).
Angora: Chankaya, 31st May, large yellow flowers, No. 87. Our plant agrees fairly well with the original description but we have not seen the type specimen. In the Fl. Or. iv. 783 (1879) the species is reduced to *P. armeniaca* Willd.
Distr. Asia Minor and Kurdistan.

Salvia bornmuelleri *Hausskn.* in Mitt. b. Ver. Jena, ix. 21 (1891)?
Angora: Chankaya, 20th May–5th June, bushes up to 2 feet high with lavender flowers, common, No. 52.
Distr. Asia Minor.

S. cadmica *Boiss.* Diagn. I. v. 6 (1844).
Angora: Chankaya, 20th–30th April, large white flowers, fairly common, No. 5.
Distr. Asia Minor.

S. ceratophylla *L.* Sp. Pl. 27 (1753).
Angora: Chankaya, 15th–31st May, a coarse plant with crinkly very narrow leaves, a tall spike, and very small dirty-white flowers, common on high ground, No. 68.
Distr. Asia Minor to Persia and Syria.

Scutellaria orientalis *L.* Sp. Pl. 598 (1753) var. **pinnatifida** *Reichb.* Ic. Crit. I. 10, t. 8f. 16 (1823); Jaub. et Spach Ill. Fl. Or. v. t. 413 (1853–57).
Angora: Chankaya, 1st–15th May, small to large yellow-lemon flowers, common, No. 25.
Distr. Balkan Peninsula, Asia Minor to Persia and Syria.

Aristolochia maurorum *L.* Sp. Pl. ed. 2. 1363 (1763).
Angora: Chankaya, 1st–15th May, flowers like a Dutchman's Pipe, growing out of the stem just above the ground, seed-pod ribbed heart-shaped, nearly 1 inch long, No. 38.
Distr. Asia Minor to Persia.

Elaeagnus angustifolius *L.* Sp. Pl. 121 (1753).
Angora: Chankaya Road, 15th–31st May, a silvery tree 10 feet high, thorny, small yellow flowers with strong rather sickly sweet smell, No. 71.
Distr. Medit. Region to China.

Euphorbia condylocarpa *M.B.*? Flor. Taur.-Cauc. i. 377 (1808).
Angora: Chankaya, 20th April, not uncommon, No. 17.
Distr. Cauc., Armenia, N. Persia.

E. gerardiana *Jacq.* Austr. v. 17, t. 436 (1778).
Angora: Chankaya, 15th–31st May, yellow heads, very common, No. 46.
Distr. E.N. Temp. Region.

E. sect. **Myrsiniteae.**
Angora: Embassy grounds, 16th–30th April, pinkish colour, fleshy, not common, No. 6.

Orchis incarnata *L.* Fl. suec. ed. 2, 312(1755) and var. **olocheilos** *Boiss.* Fl. Or. v. 71(1884).
Angora: Chankaya, May, flowers purple, common on low ground, only one or two seen at 1000 m., No. 75.
Distr. (of var.). Asia Minor to N. Persia.

Gladiolus segetum *Ker-Gawl* in Bot. Mag. t. 719(1804).
Angora: on road to Dikmen, on high ground, 15th May, purple flowers, No. 34.
Distr. Medit. Region.

Iris kerneriana *Aschers. et Sint.* ex Baker Gard. Chron. N.S. xxi. 795(1884); Dykes, The Genus Iris, 70(1913).
Angora: Chankaya, 15th–31st May, narrow leaves and yellow flowers, only one plant found on high ground, No. 66.
Distr. Asia Minor and Armenia.

Allium pulchellum *Don* in Mem. Wern. Soc. vi. 46(1826-32).
Angora: Dikmen Valley, 4th June, 9 inches high, with a single stem, pale purple flowers on long pedicels in a loose head, No. 83.
Distr. Cent. and S. Europe, N. Asia Minor to Cauc.

A. rotundum *L.* Sp. Pl. ed. 2, 423(1762).
Angora: Chankaya, 25th May–5th June, 1 foot to 18 inches high, purple flowers with white stamens, fairly common, No. 65.
Distr. Cent. and S. Europe, Asia Minor to Armenia and Irak.

Fritillaria sp.
Angora: Chankaya, 18th April, only one specimen found, perhaps the last of the season, blue and yellow flowers, No. 7. This may be a new species related to *F. citrina* Baker. We have not matched it at Kew but desire more material before describing it.

Gagea arvensis *Dum.* Prodr. Fl. Belg. 140(1827).
Angora: Chankaya, 16th–30th April, yellow flowers, common, No. 13.
Distr. Europe and Medit. Region.

Ornithogalum narbonense *L.* Cent. Pl. ii. 15(1756).
Angora: Chankaya, 25th May–5th June, stem 18 inches high, with small white flowers in a pyramidal raceme, common on lower ground, No. 63.
Distr. Medit. Region.

O. umbellatum *L.* Sp. Pl. 307(1753).
Angora: Chankaya, 15th–31st May, 8 inches high, white flowers, common, No. 43.
Distr. Europe, Asia Minor, N. Africa.

Ornithogalum sp.?
Angora: Chankaya, 15th–31st May, 1 foot high, white flowers in a pyramidal raceme, No. 49.

We are doubtful about this plant. It very closely agrees with a specimen collected by Wiedemann in "Anatolia" and named *O. narbonense* L. in Herb. Kew. Our specimens have no underground parts and the tepals are either uninerved or with only faint or vestigial lateral nerves.

III.—BACTERIAL WILT DISEASE OF BANANAS.

S. F. Ashby.

The photographs in plates iv, v and vi, show the effect of inoculating tomato and tobacco plants with pure cultures of a bacterium isolated from banana varieties affected by a vascular wilt disease in Trinidad. An account of the symptoms, character of the bacterium, and inoculation experiments was published in Tropical Agriculture, June, 1926. It was shown that the organism was evidently identical with a bacterium isolated by Rorer in 1910 from bananas affected in the same way and successfully inoculated into several varieties. Rorer suspected that it might be a strain of *Bacterium solanacearum* E. F. S., but was unable to obtain infections on solanaceous plants in Trinidad, and Erwin F. Smith could not make it infect tomato plants at Washington. Its identity had, therefore, been in doubt for some fifteen years. The inoculations I carried out on the two solanaceous species were made with pure cultures isolated from naturally diseased banana plants of the Giant Fig and Red Fig varieties and cultures reisolated from diseased suckers of the Gros Michel and Sucrier varieties, which had been inoculated with pure cultures from the Giant and Red Figs. Pure cultures reisolated from tomato and tobacco were also used for reinoculating plants of tomato and tobacco. Uninoculated control

PLATE IV.

FIG. 2.—Tomato plant with inoculated branch. (*See page* 15.)

FIG. 1.—Tobacco plants, control and inoculated. (*See page* 15).

[*To face page* 14.

PLATE V.

FIG. 4.

FIG. 3. Inoculated tobacco plants. (*See pages* 15, 16).

plants were maintained, and it may be added that no bacterial wilt disease of solanaceous or other crop plants had been observed in the locality where the inoculations were made. The young plants used were growng in galvanised cans in a glass house at the Imperial College of Triopical Agriculture, Trinidad, at the height of the dry season (March and April) under conditions of high temperature and low atmospheric humidity. The inoculations were made by pricking into the stems with sterilised needles three days old growths on slants in tubes of potato extract saccharose agar, started from single colonies in petri dishes poured with the same medium.

Fig. 1 shows an uninoculated tobacco plant (left) and an inoculated tobacco plant (right) photographed twenty-four days after inoculation. The plant which became diseased was inoculated in the stem from cultures isolated from naturally affected suckers of Giant and Red Figs. It showed a one-sided wilt of a leaf six days after inoculation and the leaves then wilted successively ; at the end of seventeen days all the leaves had wilted and gone dry except a rosette of small leaves at the apex of the stem and these showed flabby tips ; during this period growth was stagnant. The inoculated bacterium was reisolated from the midrib of a wilting leaf after nine days, and from the midrib of an apical young leaf after sixteen days. After twenty-five days the plant was cut up and the vascular region found to be browned throughout the stem, which showed a dirty-white alkaline bacterial ooze from the severed base ; the bulk of the roots were healthy in appearance. The failure of the leaves, which was at first usually on one side of the midrib, took the form of dry reddish-brown papery patches between the main veins. The uninoculated plant remained quite healthy.

Fig. 2 shows a tomato plant which was inoculated with cultures reisolated from diseased Gros Michel and Sucrier banana suckers. It had forked into two nearly equal branches and one of these (right) was inoculated two inches above the fork. This branch made practically no growth for ten days while the other grew vigorously. Adventive root-initials appeared on the inoculated branch, and a brown streak within the cortex, but there was no wilting of foliage and after a month, when the photograph was made, the branch had begun to make appreciable growth.

Fig. 3 shows a tobacco plant sixteen days after being inoculated in the stem, at the same time and with the same cultures direct from bananas, as the tomato plant in Figure 2. Leaves began to wilt after seven days and continued to fail progressively, but slowly, while the plant made appreciable growth. After eleven days the inoculated bacterium was recovered from a wilting leaf. At the end of a month some of the larger leaves were still in all stages of wilting and drying up and at the apex of the stem was a rosette of small abnormally dark green leaves, some of which had flabby tips. The plant was cut up and browning of the vascular region found extending

throughout the stem and into the petioles of the older leaves ; the severed base showed bacterial ooze while the roots appeared normal.

Fig. 4 shows the same tobacco plant, but with the pot turned round (Figure 3 was photographed on a panchromatic plate with a green screen, and Figure 4 on a similar plate with an orange-red screen, with the result that dead patches show white).

Fig. 5 shows a tomato plant inoculated at two points on the stem with cultures reisolated from the tobacco and tomato plants shown in *Figures* 1 and 2. It was photographed twelve days later. Reflexing of petioles and wilting of leaves had begun four days after inoculation, and after eight days all the leaves had wilted and adventive roots had pushed abundantly on the stem, which showed dark streaks within the cortex. The inoculated bacterium was recovered in poured plates from the midrib of a leaf near the apex of the stem. The plant was cut up after two weeks and browning of the vascular region found to be general throughout the stem and leaf stalks ; the severed base of the stem showed abundant dirty-white ooze, but the bulk of the roots were of normal colour.

Fig. 6 illustrates the pushing of adventive roots above and below the upper inoculation pricks on the stem of the tomato plant shown in Figure 5.

It may be added that a tobacco plant (not photographed) inoculated at the same time with the same reisolated cultures from tobacco and tomato as the plant in Figure 5 showed one leaf wilting after four days and a successive wilting of leaves with development of brown patches usually at first on one side of the midribs until after nineteen days all the leaves had dried up except a rosette of six small leaves at the apex of the stem, three of which were flabby. The plant was cut up and browning of the vascular region found to extend throughout the stem with bacterial ooze from the severed base, while the root system was normal in colour. The tomato plant shown in Figure 2, and another tomato plant inoculated with cultures from Gros Michel and Sucrier bananas which showed no noticeable effects after a month, were allowed to grow on, and both were reported by Professor Briton-Jones (my successor at the Imperial College of Tropical Agriculture) two months later, to be wilting ; he forwarded to me portions of the stems, sterilised with mercuric chloride solution and placed in sterilised tubes, and I recovered the inoculated bacterium from the browned vascular regions of both plants.

The cultural characters of the organism isolated from naturally affected and inoculated banana plants and from inoculated tomato and tobacco plants may be briefly summarised.

The surface colonies which appear at tropical room temperature (mean of about 25° C.) on potato extract saccharose agar plates after three days, are white or dirty-white, circular or nearly circular, entire, wet-shining, with a tendency to flow when the plate is tilted ;

PLATE VI.

FIG. 6.—Inoculated tomato stem with adventive roots. (*See page* 16).

FIG. 5.—Inoculated tomato plant. (*See page* 16).

after a few days they turn brown. On sterilised white potato slabs there is at first a wet-shining, dirty-white spreading growth, which gradually turns brown and may become finally, after a week or more, jet black. Some cultures, however, after turning brown do not become black. Beef broth peptone gelatin is not liquefied. Lavender coloured separated litmus milk turns blue after three or four days, and this colour gradually increases in intensity; there is no clot and no surface growth, but a dirty-white deposit; after a month or more the strongly alkaline milk becomes more or less translucent. Hanging drops from nutrient broth cultures twenty-four hours old show a small proportion of individuals actively motile; it is a short rod often in pairs about 1·5 × ·5 microns in size and stained smears show polar staining.

The cultural characters of the organism and the symptoms of the wilt on inoculated tobacco and tomato plants are in full agreement with those recorded for and due to *B. solanacearum* E. F. S.

B. solanacearum has been recorded by Jochems and by Palm and Jochems as attacking monocotyledons in the East. Natural infection occurred in Sumatra on two species of *Canna* (*C. glauca* Rosc. and *C. indica* L.) and on two species of *Commelina* (*C. benghalensis* L. and *C. nudiflora* L.). Pure cultures isolated from *Canna* were found to infect tobacco and balsam (*Impatiens balsamina* L.) and cultures from *Commelina* infected young plants of Hevea rubber, castor oil, tobacco and tomato. In 1924 these authors listed 128 species of flowering plants in thirty-five families susceptible to *B. solanacearum*, of which ninety species had been found infected under natural conditions; no species of *Musa* was mentioned in this list.

Although a general infection of the whole plant can be effected by inoculation into the aerial parts, the field evidence, especially for solanaceous species, indicates that infection is normally from the soil into injured roots (the potato also by means of infected tubers). The recent occurrence of the disease on the Giant Fig banana in Trinidad was restricted to a plot on one plantation, although plantings from the same batch of suckers had been made at a number of other points in the island; infection from the soil appeared therefore to be indicated, and was the more probable because the susceptible "Moko" plantain had been abandoned many years ago as a temporary shade for cacao on this plantation owing to the disease. In 1911 Rorer recorded natural infection of the Chinese or Cavendish banana, in Trinidad, and inoculated it successfully with pure cultures of the bacterium; this variety is grown widely by the peasantry and appears now to be attacked rarely, but should the area in this variety be considerably extended there will be danger of spreading the disease in infected planting material.

I am much indebted to Dr. C. L. Withycombe for the photographs.

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IV.—THE GRASSES OF THE FIJI ISLANDS.

V. S. Summerhayes and C. E. Hubbard.

The first collection of plants of any importance made in Fiji was that of the United States Exploring Expedition under the command of Commodore Wilkes in 1852, the plants being determined by Asa Gray. Other collections were made later and the whole was summed up in Seemann's admirable "Flora Vitiensis" published in 1865. In this he enumerates 19 species of *Gramineae*. Since then only isolated papers on the flora have appeared while some collections have not been dealt with critically at all. Since 1919, however, Mr. W. Greenwood has been collecting in the Islands and his plants are being dealt with at Kew. Among them are a large number of grasses, many of which are new to Fiji, the greater part of these being comparatively recent introductions while others are rarer indigenous species from the mountains. Since many of the former are becoming serious pests in the sugar plantations and cultivated ground generally, it has been thought useful to summarise our present knowledge of the grasses of Fiji in this paper. A simple key is provided to enable persons with only an elementary knowledge of botany to name the species encountered, while the principal economic uses of the species are given. The term "lemma" is used throughout the paper instead of "flowering glume." In all 59 species are here enumerated, a striking increase on the number in "Flora Vitiensis."

Key to Species.

Leaf-blade articulated with the sheath; Bamboos with woody culms .....*Schizostachyum* & *Bambusa* spp. (p. 44).

Leaf-blade not or rarely articulated with the sheath:

A. Male and female spikelets in separate inflorescences, or in different parts of the same inflorescence and of different appearance:

Male spikelets in large terminal panicles; female spikelets in sheathed "cobs" in the axils of the lower leaves.....
Zea Mays (p. 25).

Male and female spikelets in the same inflorescence, the male at the ends of the branches, the female below them, or mixed:

Female spikelets enclosed in an ovoid or globose ivory bead-like sheath; leaf-blades sessile, 1–2 in. broad; culms 3–6 ft. high .....*Coix Lacryma-Jobi* (p. 25).

Female spikelets not as above, the ovary and palea enclosed in the inflated papery lemma; leaf-blades stalked, $\frac{1}{6}$–$\frac{1}{3}$ in. wide; plant up to $2\frac{1}{2}$ ft. high.....
Leptaspis angustifolia (p. 40).

AA. Spikelets all perfect, or male and perfect, in the latter case a male being near a perfect spikelet:

Spikelets arranged in solitary or paired spike-like racemes, each raceme or pair of racemes supported by a leaf-like spathe, forming a spatheate panicle:

Racemes solitary, in flattened heads; spikelets long-awned, awns about $1\frac{1}{2}$ in. long ...*Themeda quadrivalvis* (p. 31).

Racemes paired; spikelets awnless or very shortly awned:

Spikelets awnless; panicle linear, erect, loose; spathes green .....*Cymbopogon refractus* (p. 30).

Spikelets awned; panicles oblong, spreading, dense; spathes reddish-brown ...*Cymbopogon coloratus* (p. 30).

Spikelets not arranged in a spatheate panicle:

Spikelets enveloped by long silky hairs from the base and forming a silky panicle:

Culms $1\frac{1}{2}$–4ft. high; leaf-blades 6–12 in. long, $\frac{1}{12}$–$\frac{1}{4}$ in. wide; panicle spike-like, cylindrical, 2–8 in. long...
Imperata cylindrica var. (p. 26).

Culms 6–20 ft. high; leaf-blades over 1 ft. long, over $\frac{3}{4}$ in. wide; panicle oval, spreading, over 1 ft. long:

Branches of panicle rather tough; stalks of spikelets spreading; spikelets $\frac{1}{8}$ in. long, awned.....
Miscanthus japonicus (p. 26).

Branches of panicle very fragile; stalks of spikelets adpressed ; spikelets $\frac{1}{6}$ in. long, awnless.....
Saccharum officinarum (p. 26).

Spikelets not enveloped by long silky hairs from the base:

B. Spikelets sessile or very shortly stalked, crowded, forming unbranched spikes or spike-like racemes (which are sometimes much reduced), solitary or several clustered at the apex of the culm or scattered along a short axis:

C. Spikes or racemes solitary, or with very short axillary racemes (*Stenotaphrum*):

D. Spikelets closely adpressed to and partially or wholly sunk in cavities in the rhachis:

E. Spikelets $\frac{1}{10}$–$\frac{1}{8}$ in. long, arranged in two rows on one side of the rhachis:

Leaves lanceolate, finely pointed; spikes slender; rhachis $\frac{1}{36}$–$\frac{1}{24}$ in. wide; spikelets $\frac{1}{10}$–$\frac{1}{8}$ in. long.....*Stenotaphrum subulatum* (p. 35).

Leaves narrow, blunt; spikes stout; rhachis $\frac{1}{8}$–$\frac{1}{3}$ in. wide; spikelets $\frac{1}{6}$ in. long.....*Stenotaphrum secundatum* (p. 35).

EE. Spikelets $\frac{1}{4}$–$\frac{1}{2}$ in. long, arranged in two rows on opposite sides of the rhachis; leaves finely pointed .....*Lepturus repens* (p. 44).

DD. Spikelets not sunk in cavities in the rhachis:

Spikelets each or two to three together surrounded by bristles:

Bristles free at the base, glabrous, persistent.....*Setaria glauca* (p. 38).

Bristles united at the base, the inner hairy, falling with the spikelet at maturity:

Leaves 9–18 in. long; spikes 3–10 in. long; bristles fine, closely adpressed, not or hardly thickened at the base.....*Cenchrus calyculatus* (p. 39).

Leaves 3–9 in. long; spikes 1–3 in. long; bristles stout, spreading, much thickened at the base.....*Cenchrus echinatus* (p. 39).

Spikelets not surrounded by bristles:

Spikelets awnless; spike partially or wholly enclosed in uppermost leaf.....*Thuarea involuta* (p. 39).

Spikelets awned; raceme exserted:

Spikelets all awned, awns $\frac{1}{2}$–1 in. long.....*Dichanthium caricosum* (p. 29).

Spikelets in lower part of raceme awnless; awns of upper spikelets 2–4 in. long.....*Heteropogon contortus* (p. 30).

CC. Spikes or racemes paired, digitate or scattered:

F. Racemes symmetrical (i.e. not one-sided):

Racemes 1–3 together at the apex of the culm; spikelets $\frac{1}{6}$–$\frac{1}{5}$ in. long:

Sessile spikelets with broad, blunt, almost flat lower glumes, shortly hairy; leaves usually glabrous.....*Dichanthium caricosum* (p. 29).

Sessile spikelets with narrow, pointed, convex lower glumes, glabrous; leaves shortly hairy *Ischaemum aristatum* (p. 25).

Racemes 3 or more, spikelets $\frac{1}{12}$–$\frac{1}{8}$ in. long:

Panicle 4–9 in. long; lower glume of sessile spikelets pitted...*Amphilophis glabra* (p. 29).

Panicle $1\frac{1}{2}$–3 in. long; lower glume of sessile spikelet not pitted:

Leaves narrow, up to 1 ft. long; racemes bare at the base; lower glume not grooved.....
Dichanthium annulatum (p. 29).

Leaves narrow-lanceolate, $1\frac{1}{2}$–$3\frac{1}{2}$ in. long; racemes with spikelets right to the base; lower glume grooved.....
Pollinia glabrata (p. 28).

FF. Spikes and racemes one-sided:

Spikelets awned:

Racemes clustered at the apex of the culm:

Culms erect, 1–3 ft. high; spikes 6–10; spikelets wedge-shaped.....
Chloris truncata (p. 42).

Culms creeping, up to 15 in. high; spikes 3–6; spikelets narrowly oblong .....
Chloris cynodontoides (p. 43).

Racemes scattered:

Racemes elongated; leaf-blades $\frac{1}{6}$–$\frac{3}{4}$ in. wide:

Racemes longer than the internode between them; spikelets loose.....
Oplismenus compositus (p. 37).

Racemes shorter than the internode between them; spikelets contiguous .....
Oplismenus hirtellus (p. 37).

Racemes reduced to sessile clusters; leaf-blades $\frac{1}{6}$–$\frac{1}{3}$ in. wide .....
Oplismenus imbecillis (p. 37).

Spikelets awnless:

Spikelets breaking up at maturity, leaving the glumes on the stalks:

Spikelets 1-flowered, $\frac{1}{12}$ in. long; low, creeping, perennial grass...*Cynodon Dactylon* (p. 42).

Spikelets 3–6-flowered, $\frac{1}{8}$–$\frac{1}{6}$ in. long; erect, annual grass.....*Eleusine indica* (p. 43).

Spikelets falling entire from their stalks at maturity, always 2-flowered, the lower flower male or barren:

G. Racemes paired or clustered at the apex of the culm:

H. Racemes paired; lower glume absent:

Racemes 2–6 in. long; spikelets $\frac{1}{16}$ in. long, elliptical, blunt, hairy .....
Paspalum conjugatum (p. 34).

Racemes $\frac{1}{2}$–$1\frac{1}{2}$ in. long; spikelets about $\frac{1}{8}$ in. long, ovate, acute, glabrous.....
Paspalum vaginatum (p. 34).

HH. Racemes clustered (more than two):
Lower glume absent; leaves blunt; sheaths much compressed.....
Axonopus compressus (p. 33).
Lower glume present although very small; leaves acute; sheaths slightly compressed:
Spikelets about $\frac{1}{8}$ in. long.....
Digitaria pruriens (p. 31).
Spikelets $\frac{1}{24}$–$\frac{1}{16}$ in. long:
Culms usually erect; leaf-blades $1\frac{1}{4}$–6 in. long; racemes $2\frac{1}{4}$–$4\frac{1}{2}$ in. long; fruiting glume (lemma) black...*Digitaria chinensis* (p. 32).
Culms creeping and ascending; leaf-blades $\frac{1}{4}$–$1\frac{1}{4}$ in. long; racemes 1–2 in. long; fruiting glume (lemma) pale.....
Digitaria longiflora (p. 31).

GG. Racemes scattered:
Stalks of spikelets swollen and darkened at the tips .....*Eriochloa ramosa* (p. 32).
Stalks not swollen or darkened at the tips:
Racemes short, $\frac{1}{4}$–1 in. long, slightly shorter to slightly longer than the internodes...*Echinochloa colona* (p. 36).
Racemes $\frac{3}{4}$–3 in. long, usually much longer than the internodes:
Racemes 8 or more:
Culms 3–8 ft. high; leaves narrow, up to 1 ft. long; panicle 4–8 in. long; spikelets $\frac{1}{8}$ in. long.....
Brachiaria mutica (p. 33).
Culms 6–18 in. long; leaves lanceolate, $\frac{1}{2}$–$2\frac{1}{2}$ in. long; panicle 1–3 in. long; spikelets $\frac{1}{16}$–$\frac{1}{12}$ in. long.....*Urochloa reptans* (p. 35).
Racemes rarely 7, usually fewer:
Racemes 2–4 in. long; spikelets silky-hairy on margins, elliptical, acute .*Paspalum dilatatum* (p. 34).
Racemes $\frac{3}{4}$–$2\frac{1}{2}$ in. long; spikelets glabrous:
Spikelets orbicular, rounded at apex, brownish, $\frac{1}{12}$ in. long.....
Paspalum orbiculare (p. 34).
Spikelets narrowly oblong-elliptical or ovate-oblong, not rounded, $\frac{1}{8}$–$\frac{1}{6}$ in. long:

Leaves glabrous; spikelets widest towards tip; upper lemma rounded .....
Brachiaria distachya (p. 32).
Leaves hairy; spikelets oblong-lanceolate; upper lemma with a fine point.....
Urochloa paspaloides (p. 36).

BB. Spikelets all or some stalked, more or less loose, forming an open or contracted panicle:
Spikelets large, $\frac{1}{4}$–$\frac{1}{2}$ in. long, 1-flowered, very much compressed except when in fruit; glumes very small
Oryza sativa (p. 40).
Spikelets not having the above characters in combination:

K. Spikelets all awnless (also rarely so in *Garnotia*):
Spikelets bulging on one side, more or less compressed, $\frac{1}{16}$–$\frac{1}{12}$ in. long, brownish.....
Cyrtococcum oxyphyllum (p. 38).
Spikelets symmetrical or nearly so:
Leaves broadly lanceolate; lemmas usually spiny
Centotheca latifolia (p. 43).
Leaves narrow to narrowly lanceolate:
Spikelets 3–12-flowered (rarely 2-flowered):
Panicle closely branched; branches short; spikelets oblong; keels of paleas shortly hairy .....*Eragrostis plumosa* (p. 42).
Panicle very loose and wavy; branches long; spikelets narrow; paleas glabrous
Eragrostis pilosa (p. 42).
Spikelets 1–2-flowered:
Spikelets prickly-warty .....
Vetiveria zizanioides (p. 28).
Spikelets smooth:

L. Spikelets 2-flowered, falling entire from their stalks at maturity; fruiting glume (lemma) hard and enclosing grain:
Lemmas similar in texture and shape; spikelets $\frac{1}{16}$ in. long, on very short stalks (rarely longer than the spikelets); panicle-axis shortly hairy
Isachne vitiensis (p. 40).
Lemmas different in texture and shape, the lower resembling the upper glume; spikelets $\frac{1}{12}$–$\frac{1}{6}$ in. long, on stalks longer than the spikelets; panicle-axis glabrous:

Culms to over 10 ft. high; leaf-blade margins rough; spikelets blunt, $\frac{1}{8}$–$\frac{1}{6}$ in. long.....
Panicum maximum (p. 37).
Culms 2–4 ft. high; leaf-blade margins smooth; spikelets pointed, $\frac{1}{12}$–$\frac{1}{8}$ in. long.....
Panicum decompositum (p. 37).
LL. Spikelets 1-flowered, breaking up at maturity leaving the glumes on their stalks; fruiting glume (lemma) delicate with the grain free:
Panicle dense; branches erect, with spikelets right to the base; spikelets $\frac{1}{16}$–$\frac{1}{12}$ in. long.....
Sporobolus indicus (p. 41).
Panicle loose; branches spreading, naked at the base; spikelets $\frac{1}{20}$–$\frac{1}{16}$ in. long .....
Sporobolus diander (p. 41).
KK. Spikelets all, or at least some of them, awned:
Spikelets in threes, one sessile, two stalked, each shortly bearded at the base with brown hairs
Chrysopogon aciculatus (p. 28).
Spikelets solitary, paired or if clustered then glabrous:
Spikelets long hairy, bulging on the sides.....
Rhynchelythrum Dregeanum (p. 38).
Spikelets shortly hairy or glabrous, not bulging:
Spikelets delicate, $\frac{1}{8}$–$\frac{1}{6}$ in. long; culms weak, 1–3 ft. long .....*Garnotia stricta* (p. 41).
Spikelets firm or hardened; tall, slender to coarse grasses, usually over 3 ft. high:
Annual; leaf-blades $1\frac{1}{2}$–3 in. wide; spikelets elliptic-ovate, obtuse .....
Sorghum bicolor (p. 27).
Perennial; leaf-blades $\frac{1}{6}$–$\frac{3}{4}$ in. wide; spikelets narrow- to lanceolate-oblong, acute:
Sessile spikelets $\frac{1}{5}$ in. long, $\frac{1}{12}$ in. wide, oblong-lanceolate; branches of panicle divided.....*Sorghum halepense* (p. 27).
Sessile spikelets $\frac{1}{8}$ in. long, less than $\frac{1}{24}$ in. wide, narrowly lanceolate; branches of panicle simple, rarely divided.....
Amphilophis glabra (p. 29).

In the following enumeration when there are more than one species in a genus, characters of generic value are given usually in

the description of the first species only. In a few cases such characters are given separately at the beginning. Only such synonymy as seems necessary is given.

1. Coix Linn.

C. Lacryma-Jobi *Linn.* Sp. Pl. ed. i. 972; Seem. Fl. Vit. 326.

Erect annual. Culms stout, 3–6 ft. high. Leaves smooth, glabrous; blades narrowly lanceolate, 4–18 in. long, 1–2 in. wide. Spikelets unisexual in terminal and axillary spike-like racemes; male inflorescence $\frac{1}{2}$–$1\frac{1}{2}$ in. long, with spikelets $\frac{1}{4}$–$\frac{1}{3}$ in. long in groups of two or three, of which one is sessile and the others stalked, on a slender rhachis protruding from a shining, white or bluish, globose or ovoid, ivory bead-like sheath $\frac{1}{4}$–$\frac{1}{3}$ in. long, which encloses the female spikelet.

Viti Levu: Mts. near Lautoka, 900 ft., Jan., *Greenwood*, 186! Taveuni: Somosomo, May, *Seemann*, 692! Ngau: Sept., *Milne* 176! Ovalau: *Wilkes*! Matuku: Challenger Exped., July, *Moseley*! (Herb. Mus. Brit.). Without definite locality: Nov., *Harvey*! (Herb. Mus. Brit.). *Home*! (Herb. Mus. Brit.). Swamps, near streams, edges of creeks, on open hill-sides, etc., common, 800–1500 ft. (Greenwood).

Native in Tropical Asia; cultivated or as a weed in the tropics and in some warm temperate countries.

In India this grass is used as fodder for cattle. The false fruits are used as beads for decorative purposes, and one variety with thin shells is an important cereal in Burma, etc.

Vern. Names: "Job's Tears," Sila (Fiji).

2. Zea Linn.

Z. Mays *Linn.* Sp. Pl. ed. i. 971.

Stout annual, 10–16 ft. high. Leaf-blades narrowly lanceolate, to over 3 ft. long and 4 in. wide, the tips usually drooping. Spikelets unisexual in different inflorescences; male spikelets in large terminal panicles up to 8 in. long composed of spike-like racemes; the female in 4–11 longitudinal rows on the axis of stout, sheathed "cobs" of varying size borne in the axils of the lower leaves, with the styles projecting as long silky tassels.

An important cereal and fodder plant of American origin, cultivated generally by the white settlers. For information on cultivation, etc., see Montgomery, Corn Crops (1913) 1–275; Burtt Davy, Maize (1914).

Vern. Names: "Maize" or "Indian Corn." Sila ni papalagi (Fiji).

3. Ischaemum Linn.

I. aristatum *Linn.* Sp. Pl. ed. i. 1049. *I. ciliare* Retz. Obs. vi. 36.

Perennial. Culms 2–5 ft. high, nodes bearded. Leaf-sheaths loose, hairy; blades narrow, 6–12 in. long, shortly hairy.

Spikelets paired, one sessile, the other stalked, on the hairy, jointed rhachis of paired, 1½–2 in. long spike-like racemes, falling at maturity with the joints and stalks. Spikelets all alike, ⅛ in. long, 2-flowered, lower male, upper perfect, purplish, glabrous, awned, awn ½ in. long; glumes coriaceous; lemmas membranous.

Vanua Levu: Tabacola near Lambasa, May, *W. E. Lindsay in Herb. Greenwood*, 590!

Tropical Asia and Malaya.

Said to have first appeared near Lambasa about 4 years previously, i.e. in 1919. May quite possibly become a pest in cane lands.

4. Imperata Cyr.

I. cylindrica *Beauv.* Agrost. 165, var. **Koenigii** *Dur. & Schinz* Consp. Fl. Afr. v. 694. *I. arundinacea* Seem. Fl. Vit. 322.

Tufted perennial. Culms 1½–4 ft. high. Basal leaf-blades narrow, 6–12 in. long, ⅛–¼ in. wide, upper shorter. Spikelets paired, unequally stalked, on the continuous branches of a silvery, silky, cylindrical, spike-like panicle 2–8 in. long; spikelets falling entire at maturity, all alike, ⅛–⅙ in. long, 2-flowered, lower floret barren, upper perfect, awnless, enveloped by long silky hairs from the base.

Viti Levu: Lautoka, Apr., *Greenwood*, 32! Vanua Levu: *Wilkes*! Wakaya: Oct., *Milne*, 397! Ngau: Sept., *Milne*, 176! Oct., *Milne*, 218! Viti Levu, Ovalau & Koro: without definite locality, *Horne*, 203! Common, in waste places, on the edges of drains and on well-drained dry slopes.

Tropical Africa and Asia, Malaya and Polynesia.

Of little or no agricultural value. It is a pestilent weed on cultivated ground, and when once established is extremely difficult to eradicate. "Spreads like couch-grass" (Horne).

5. Miscanthus Anderss.

M. japonicus *Anderss.* in Oefv. Vet. Akad. Stockh. 1855, 166.

Perennial. Culms 6–15 ft. high, stout. Leaf-blades narrow, 1½–3 ft. long, ¾–1¼ in. wide, glabrous, margins rough. Spikelets paired, unequally stalked, on the continuous or obscurely jointed, slender branches of a broad oblong or oval panicle 1–1½ ft. long; spikelets falling entire at maturity, all alike, lanceolate, ⅛ in. long, 2-flowered, lower floret barren, upper perfect, enveloped by long silky hairs from the base, usually awned, awn ⅙–⅓ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 277! Common, all over mountain slopes and in swamps, nearly to sea-shore.

China, Japan, Malaya and Polynesia.

Periodically burnt off by natives to get at wild yams (Greenwood).

6. Saccharum Linn.

S. officinarum *Linn.* Sp. Pl. ed. i. 54; Seem. Fl. Vit. 321. *Eulalia japonica* Seem. Fl. Vit. 321 (as to the Fiji specimens), non Trin.

Perennial. Culms stout, solid, 6–20 ft. high. Leaf-blades up to 5 ft. long and $2\frac{1}{2}$ in. wide. Spikelets paired, one sessile, the other stalked, on the jointed fragile branches of a very large, dense, oval panicle; spikelets falling entire at maturity, all alike, narrowly oblong, nearly $\frac{1}{6}$ in. long, 2-flowered, lower floret barren, upper perfect, awnless, enveloped by long silky hairs from the base.

Taveuni: Somosomo, May, *Seemann*, 691! Also on Vanua Levu according to Seemann. Without exact locality: *Horne*, 701! Occurs all over the group, often apparently wild, but also now cultivated extensively.

Tropics generally, cultivated.

Natives employ juice for sweetening their puddings (Seemann).

Vern. Names: Dovu (*Seemann*); Vico (*Horne*).

7. Sorghum Pers.

S. bicolor *Moench*. Meth. 207.

Annual. Culms stout, up to 14 ft. high. Leaf-blades narrowly lanceolate, up to 22 in. long, $1\frac{1}{2}$–3 in. wide. Spikelets paired, dissimilar, one sessile, the other stalked, on the tough branches of dense, narrowly oblong panicles 3–10 in. long, by 2–$3\frac{1}{2}$ in. wide; spikelets falling entire at maturity, 2-flowered, the upper floret of the sessile spikelet alone perfect, the remainder male or barren. Sessile spikelet $\frac{1}{5}$ in. long by $\frac{1}{8}$ in. wide, elliptic-ovate, shortly hairy, straw-coloured with brownish tips, awned, awn $\frac{1}{6}$ in. long. Stalked spikelets narrow, $\frac{1}{6}$–$\frac{1}{5}$ in. long, reddish-brown.

Taveuni: cultivated, *Seemann*, 689!

Cultivated in tropical and subtropical regions.

S. halepense *Pers*. Syn. i. 101. *Andropogon halepensis* Brot. Fl. Lusit. i. 89.

Perennial from a long rhizome. Culms slender to moderately stout, $1\frac{1}{2}$–4 ft. high. Leaf-blades narrow, 6–20 in. long, $\frac{1}{4}$–$\frac{3}{4}$ in. wide. Panicle narrowly ovate or oblong, 5–12 in. long, 1–$2\frac{1}{2}$ in. wide, more or less dense. Sessile spikelets oblong-lanceolate, about $\frac{1}{5}$ in. long, $\frac{1}{12}$ in. wide, straw-coloured to purplish, shortly hairy, awn $\frac{1}{2}$ in. long. Stalked spikelets lanceolate, $\frac{1}{5}$–$\frac{1}{4}$ in. long, pale to deep purple.

Viti Levu: Lautoka, June, *Greenwood*, 302!

Occurs in most warm temperate and subtropical countries.

Occasionally grown as a fodder grass in America, etc., but is difficult to eradicate when once established. Originally imported into Fiji about 1905, to supply feed for stock. Although at first difficult to grow it later spread rapidly and is now a troublesome pest in cane land in the Ba district. It also occurs occasionally in Wadi district. It grows along railway lines and seeds are carried along by passing trains, and swept out elsewhere.

Vern. Name: "Johnson Grass".

8. Vetiveria Thouars.

V. zizanioides *Nash* in Small Fl. S.E. U.S., 67.

Perennial from a stout rhizome. Culms stout, up to 9 ft. high. Leaf-sheaths compressed, especially at the base ; blades narrow, 1–3 ft. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide, glabrous. Spikelets paired, nearly alike, one sessile, the other stalked, on the jointed, fragile, whorled branches of an oblong, usually contracted panicle up to 1 ft. or more long; spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect, the remainder male or barren. Sessile spikelet narrowly lanceolate, $\frac{1}{6}$–$\frac{1}{5}$ in. long, purplish, awnless; glumes with minute prickly warts, those of the stalked spikelets almost smooth.

Viti Levu : Lautoka, Apr., *Greenwood*, 228!

Native in Tropical Asia.

Cultivated on account of aromatic rhizomes in many parts of the Tropics. The source of Vetiver Oil. "Planted as a border to paths up to houses but has been thrown on rubbish heaps and become established and now quite naturalised" (Greenwood).

Vern. Name: "Vetiver Grass".

9. Chrysopogon Trin.

C. aciculatus *Trin.* Fund. Agrost. 188. *Andropogon aciculatus* Retz. Obs. v. 22 ; Seem. Fl. Vit. 320.

Perennial. Culms erect from a creeping base, slender, 1–2 ft. high. Leaves densely tufted; blades 1–5 in. long, $\frac{1}{8}$–$\frac{1}{5}$ in. wide, obtuse or acute, glabrous. Spikelets in threes at the ends of the branchlets of a narrow, 1–3 in. long panicle, one sessile, the others stalked, falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect. Sessile spikelets $\frac{1}{6}$ in. long, narrowly lanceolate, shortly bearded at the base with brown hairs, awned, awn $\frac{1}{6}$–$\frac{1}{3}$ in. long. Stalked spikelets $\frac{1}{4}$ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 17! Taveuni: June, *Seemann*, 686! Ovalau: Oct., *Milne*, 280! Also in Vanua Levu and Lakemba (Seemann). In dry sunny places (Seemann), and waste places on high grounds (Milne). Not frequent.

Tropical Asia, Australia and Polynesia.

10. Pollinia Trin.

P. glabrata *Trin.* in Bull. Acad. St. Pétersb. i. (1836) 70.

Weak, straggling, branched, glabrous annual. Culms up to 4 ft. long, slender, many-jointed. Leaf-blades narrowly lanceolate, finely pointed, rounded at the base, 1½–3½ in. long, $\frac{1}{6}$-$\frac{5}{6}$ in. wide. Spikelets paired, alike, one sessile, the other stalked, on the fragile rhachis of 4–9 very slender, glabrous, spreading, spike-like racemes forming a panicle 1½–3 in. long; spikelets falling entire at maturity, $\frac{1}{12}$-$\frac{1}{10}$ in. long, 2-flowered, lower floret of sessile spikelet alone

perfect, remainder male or barren, awned, awn very fine, flexuous, up to ½ in. long; lower glume grooved.

Viti Levu: Mt. Evans, falls, 2000 ft., May, *Greenwood*, 223! Lautoka, on mountains, 800 ft., May, *Greenwood*, 716! Vanua Levu: mountains on Mathuata coast, in shade at edge of forest, 400 ft., May, *Greenwood*, 673!

Polynesia and Philippine Islands.

11. Amphilophis Nash.

A. glabra *Stapf* in Prain Fl. Trop. Afr. ix. 172. *Andropogon glaber* Roxb. Fl. Ind. i. 271.

Erect tufted perennial. Culms moderately stout, to over 3 ft. high. Leaf-blades narrow, to more than 1 ft. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide, finely pointed, margins rough. Spikelets paired, one sessile, the other stalked, on the fragile, jointed rhachis of several shortly stalked, slender racemes, forming a narrowly oblong, purplish panicle 4–9 in. long, 1–1½ in. wide. Racemes ½–1½ in. long, obscurely hairy. Spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect. Sessile spikelets narrowly lanceolate, ⅛ in. long, awned, awn ¼–½ in. long; lower glume pitted. Stalked spikelet ⅛ in. long, awnless.

Viti Levu: Lautoka, Jan., *Greenwood*, 1! Vanua Levu: Lambasa, 100 ft., Aug., *Greenwood*, 1 A!

Tropical Asia, Tropical and South Africa, Madagascar, N.E. Australia and Polynesia.

12. Dichanthium Willemet.

D. caricosum *A. Camus* in Lecomte Fl. Gen. l'Indo-Chine vii. 318. *Andropogon caricosus* Linn. Sp. Pl. ed. ii. 1480.

Perennial. Culms erect from a creeping base, 1–3 ft. high, nodes usually glabrous. Leaf-blades 1½–8 in. long, $\frac{1}{10}$–¼ in. wide, finely pointed. Spikelets paired, one sessile, the other stalked, on the many-jointed rhachis of 1–3 purplish, wavy racemes 1–4 in. long. Spikelets falling entire at maturity, 2-flowered, the upper floret of the sessile spikelet alone perfect, closely overlapping, broadly oblong, obtuse, ⅙–⅕ in. long, $\frac{1}{12}$ in. wide, shortly hairy, awned, awn ½–1 in. long. Stalked spikelets awnless.

Vanua Levu: Lambasa, fairly common in moist places, June, *Greenwood*, 594!

Tropical Asia, Malaya and New Caledonia.

D. annulatum *Stapf* in Prain Fl. Trop. Afr. ix. 178. *Andropogon annulatus* Forsk. Fl. Aegypt. Arab. 173.

Differs from *D. caricosum* as follows:—Culms densely tufted, to over 3 ft. high, nodes usually long bearded. Racemes 3–9, rarely fewer. Spikelets narrowly oblong, ⅛–⅙ in. long, $\frac{1}{24}$ in. wide.

Viti Levu: Lautoka, sea level, June, *Greenwood*, 720!

India, China, Africa, Australia and Polynesia.

Considered good fodder in India.

C. refractus *A. Camus* in Bull. Mus. Hist. Nat. Paris, xxviii. 108. *Andropogon refractus* R. Br. Prod. i. 202; Seem. Fl. Vit. 320.

Densely tufted perennial. Culms erect, 2–5 ft. high. Leaf-sheaths up to 4 in. long; blades narrow, up to 1 ft. long, $1\frac{1}{2}$–$\frac{1}{6}$ in. wide. Spikelets paired, dissimilar, one sessile, the other stalked, on the fragile, jointed rhachis of paired spike-like racemes, each pair of racemes supported by a pale green, leafy bract $\frac{3}{4}$–1 in. long and collected into a narrow, erect, loose panicle 5–12 in. long. Racemes $\frac{1}{3}$ $\frac{2}{3}$ in. long, spreading or reflexed. Spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect; sessile spikelets $\frac{1}{6}$–$\frac{1}{4}$ in. long.

Viti Levu: Lautoka, mts., Dec., *Greenwood*, 178! 700 ft., Dec., *Greenwood*, 178 A! Vanua Levu: Mathuata Coast, Oct., *Seemann*, 685! Without definite locality: *Horne*, 637! Also on Lakemba (Seemann). Common on sunny, dry, open hillsides.

Australia and Polynesia.

C. coloratus *Stapf* in Kew Bull. 1906, 356.

Differing from *C. refractus* by the following:—Culms over $4\frac{1}{2}$ ft. high, stout. Lower leaf-sheaths about 1 ft. long; blades 6 in. or more long. Panicle dense, spreading, 9–30 in. long; racemes very numerous, $\frac{1}{3}$ $\frac{1}{2}$ in. long, slightly diverging; leafy bracts $\frac{1}{3}$–$\frac{1}{2}$ in. long, reddish-brown. Sessile spikelets $\frac{1}{8}$ in. long.

Without definite locality: Comm. Imperial Institute, 30837!

A native of India.

One of the Lemon Oil Grasses. Introduced and cultivated in the islands, and possibly the same species as referred to by Seemann in Fl. Vit. 320.

Vern. Names: Coboi (Fiji), "Lemon Grass".

14. Heteropogon Pers.

H. contortus *Beauv. ex Roem. & Schult.* Syst. Veg. ii. 836. *Andropogon contortus* Linn. Sp. Pl. ed. i. 1045.

Tufted perennial. Culms erect or ascending, often branched. Leaf-sheaths keeled; blades narrow, 3–9 in. long, $\frac{1}{8}$–$\frac{1}{3}$ in. wide, acute or obtuse. Spikelets 2-flowered, paired, one sessile, the other stalked, on the jointed rhachis of solitary racemes 1–3 in. long. Basal part of racemes composed of 3–10 pairs of awnless, similar, persistent, male or barren spikelets, and the upper part of to 12 pairs of dissimilar, deciduous, awned spikelets with the upper floret of the sessile spikelet alone perfect; awn bent, 2–4 in. long, dark brown.

Viti Levu: Lautoka, Sept., *Greenwood*, 97! Wakaya: Oct., *Milne*, 401! Abundant on waste ground (Milne).

Tropical and sub-tropical regions.

It is a good fodder when young and tender, but troublesome and even dangerous when mature on account of the sharp-pointed bases of the spikelets. Hay which has been made from it keeps for many years. The stems are used as a fibre in the manufacture of coarse mats, and for thatching in India.

15. Themeda Forsk.

T. quadrivalvis *O. Ktze.* Rev. Gen. Pl. ii. 794. *Anthistiria ciliata* Linn. f. Suppl. 113.

Annual. Culms up to 5 ft. high. Leaf-blades narrow, up to 1 ft. long, $\frac{1}{6}$–$\frac{1}{4}$ in. wide, glabrous or fringed with hairs. Spikelets paired, the lowest two pairs alike, sessile, sterile, persistent, forming a false cup in which are inserted one or two pairs of spikelets of different appearance, one of each pair sessile and fertile, the other stalked and sterile, the whole forming a solitary raceme supported by a leafy bract, terminating the branches and branchlets of a leafy panicle 6–12 in. long. Fertile spikelets cylindrical, $\frac{1}{6}$ in. long, awned, awn about $1\frac{1}{2}$ in. long. Lower sessile spikelets compressed, $\frac{1}{5}$ in. long; glumes with warty-based hairs.

Viti Levu: Lautoka, edge of road, Oct., and Apr., *Greenwood*, 137! "Only two plants seen. Looks like a very recent introduction" (Greenwood).

A native of India, where it is used for fodder.

16. Digitaria Hall.

D. pruriens *Buese* in Miq. Pl. Jungh. 379. ?*Panicum sanguinale* Seem. Fl. Vit. 325.

Perennial. Culms erect or ascending from a creeping base, 6–36 in. high. Leaf-sheaths usually hairy; blades narrowly lanceolate, 3–$8\frac{1}{2}$ in. long (rarely shorter), $\frac{1}{6}$–$\frac{1}{2}$ in. wide, margins thickened. Spikelets all alike, paired, unequally stalked, on one side of and with the lower glume turned away from the three-angled rhachis of 3–13 spike-like racemes 3–$6\frac{1}{2}$ in. long. Spikelets 2-flowered, the upper floret only perfect, falling entire at maturity, awnless, lanceolate, $\frac{1}{8}$ in. long; lemma of fertile floret of firmer texture than the glumes, pale.

Viti Levu: Lautoka, Sept., *Greenwood*, 96! Apr., *Greenwood*, 23! In mountains at 700 ft., Dec., *Greenwood*, 407! Vanua Levu: Lambasa, Aug., *Greenwood*, 467! Ovalau: Oct., *Milne*, 277! Nairai: Nov., *Milne*, 164! Without definite locality: *Horne*, 326! *Wilkes*! Open fields, waste places and cultivated ground. Frequent everywhere.

India, Malaya and Polynesia.

D. longiflora *Pers.* Syn. i. 85.

Differing from *D. pruriens* by the following:—Creeping perennial grass, with ascending culms 4–12 in. high. Leaves glabrous; blades

lanceolate, $\frac{1}{4}$–$1\frac{1}{4}$ in. long, $\frac{1}{12}$–$\frac{1}{6}$ in. wide, rather stiff. Racemes 2–3, slender, 1–2 in. long. Spikelets ovate-lanceolate, about $\frac{1}{18}$ in. long, whitish; fruiting floret ellipsoid, white.

Viti Levu: Lautoka, very common, Jan., *Greenwood*, 187!

Tropical and South Africa, Mascarene Is., Tropical Asia, Australia and Polynesia.

Excellent sward in wet season, but dies out in May and June and gets very thin (Greenwood).

D. chinensis *Hornem.* Hort. Hafn. Suppl. 8. *Paspalum filiforme* Rendle in Journ. Linn. Soc. Bot. xxxix. 181.

Similar to *D. longiflora* and differing from that and the first species in being a tufted perennial with erect or ascending culms 9–24 in. high. Leaves glabrous; blades narrowly lanceolate, $1\frac{1}{4}$–6 in. long, $\frac{1}{12}$–$\frac{1}{5}$ in. wide. Racemes 2–5, $2\frac{1}{2}$–$4\frac{1}{2}$ in. long. Spikelets ovate-lanceolate, $\frac{1}{24}$–$\frac{1}{16}$ in. long; fruiting floret oblong, acute, black.

Viti Levu: Lautoka, common on open hillsides, 600 ft., Jan., *Greenwood*, 185! Nandarivatu, land under cultivation, 2700 ft., Sept., *Gibbs*, 867! (Herb. Mus. Brit.).

India, Indochina, Malaya, China, Japan and Korea. A recent introduction to Fiji (Rendle).

17. Eriochloa H.B. & K.

E. ramosa *O. Ktze.* Rev. Gen. Pl. ii. 775.

Tufted, almost glabrous annual. Culms up to 2 ft. or more high. Leaf-blades narrow, 2–6 in. long, $\frac{1}{6}$–$\frac{1}{3}$ in. wide, smooth. Spikelets alike, paired or solitary and falling entire from their stalks (the latter with thickened black tips), in two rows on one side of the three-angled rhachis of usually numerous, erect or drooping spike-like racemes, forming a loose, narrow panicle 2–6 in. long. Spikelets 2-flowered, upper floret alone perfect, oblong, finely pointed, $\frac{1}{8}$ in. long, obscurely hairy.

Viti Levu: Suva, fairly common in moist places such as on edges of gutters at sides of streets, Jan., *Greenwood*, 576! Apr., *Greenwood*, 576 A!

Common throughout Tropical Asia and Africa.

18. Brachiaria Griseb.

B. distachya *A. Camus* in Lecomte Fl. l'Indo-Chine vii. 437. *Panicum distachyum* Linn. Mant. ii. 183.

Perennial. Culms straggling and creeping below, slender, branched, 6–24 in. high, nodes glabrous. Leaf-blades 2–6 in. long (rarely shorter), $\frac{1}{8}$–$\frac{1}{3}$ in. wide, glabrous. Spikelets alike, solitary, falling entire from their stalks, on one side of and with the lower glume adjacent to the rhachis of 2–7 spreading or reflexed, spike-like racemes $\frac{3}{4}$–$2\frac{1}{2}$ in. long, forming a panicle 2–4 in. long. Spikelets 2-flowered, the upper floret alone perfect, oblong-ellipsoid, $\frac{1}{8}$–$\frac{1}{6}$ in. long.

Viti Levu: Lautoka, very common, Apr., *Greenwood*, 93! Tavua, 300 ft., Oct., *Greenwood*, 328 A!

India, China, Malaya, Australia and Polynesia.

Excellent for making lawns, as it forms a thicker turf than *Cynodon Dactylon* and does not wither in dry weather. (Greenwood).

Vern. Name: "Thurston Grass".

B. mutica *Stapf* in Prain Fl. Trop. Afr. ix. 526. *Panicum muticum* Forsk. Fl. Aegypt. Arab. 20. *P. barbinode* Trin. in Mém. Acad. St. Pétersb. Sér. vi. iii. 2. (1835) 256.

Differing from *B. distachya* by the following:—Perennial. Culms 3–8 ft. high, stout, nodes bearded. Leaf-blades up to 1 ft. long, $\frac{1}{4}$–$\frac{2}{3}$ in. wide, usually glabrous. Panicle 4–8 in. long; racemes numerous, sometimes branched, flexuous, spreading, 2–4 in. long. Spikelets paired or solitary, oblong, about $\frac{1}{8}$ in. long.

Viti Levu: Lautoka, Apr., *Greenwood*, 194! Grows in wet places such as drains, etc., and with its long runners soon covers the ground.

A native of South America and West Africa, but introduced elsewhere.

A great favourite with stock, but is an extremely bad weed in cultivated land, being especially troublesome on the wet side of Viti Levu around Suva and Nausori.

Vern. Name: "Para Grass".

19. Axonopus Beauv.

A. compressus *Beauv.* Agrost. 154. *Paspalum compressum* Rasp. in Ann. Sci. Nat. sér. 1. v. 301.

Tufted perennial. Culms 6–24 in. high, more or less compressed below. Leaves glabrous or with hairy margins; sheaths compressed; blades narrow to lanceolate, obtuse, rarely acute, 2–5 in. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide, folded or flat. Spikelets alike, sessile, solitary, falling entire and with the upper glume turned away from the three-angled rhachis of 2–5 slender, glabrous spikes 2–4 in. long. Spikelets 2-flowered, upper floret alone perfect, $\frac{1}{12}$–$\frac{1}{6}$ in. long; lower glume absent.

Vanua Levu: Lambasa, common in moist situations, May, *Greenwood*, 592!

Native of Tropical and Subtropical America, introduced elsewhere.

An important pasture grass in the West Indies, etc.

Vern. Name: "Carpet Grass".

20. Paspalum Linn.

Spikelets alike, awnless, falling entire at maturity, on one side of and with the upper glume adjacent to the flattened rhachis of spike-like racemes. Spikelets 2-flowered, upper floret alone perfect; lower glume usually absent.

P. conjugatum *Berg.* in Act. Helv. vii. 129, t.8.

Perennial, up to 2 ft. high, in small tufts, often with long runners. Culms erect or ascending. Leaf-sheaths compressed and keeled, glabrous or nearly so; blades narrow to narrowly lanceolate, finely pointed, up to 7 in. long, $\frac{1}{4}$–$\frac{1}{2}$ in. wide, soft, hairy and rough on the margins. Racemes paired, 2–6 in. long; rhachis $\frac{1}{3\frac{1}{2}}$ in. wide. Spikelets in two rows, solitary, $\frac{1}{1\frac{1}{6}}$ in. long, broadly elliptical, greenish-yellow, hairy.

Viti Levu: Lautoka, common in shady places by sides of creeks and in other wet localities, Nov., *Greenwood*, 174!

Native in Tropical and Subtropical America and Africa, introduced elsewhere.

Often forms extensive mats in moist places, spreading rapidly and covering the ground to the exclusion of everything else. Very acceptable food to cattle and horses.

Vern. Name: "Sour Grass".

P. vaginatum *Sw.* Prodr. Veg. Ind. Occ. 21.

Perennial. Culms ascending from a creeping base, 1$\frac{1}{2}$–2 ft. high. Leaf-sheaths more or less compressed; blades narrow, 1–4 in. long, $\frac{1}{2\frac{1}{4}}$–$\frac{1}{8}$ in. wide, pointed, glabrous, margins smooth. Racemes 2 (rarely 3), $\frac{1}{2}$–1$\frac{1}{2}$ in. long; rhachis $\frac{1}{2\frac{1}{4}}$ in. wide. Spikelets in two rows, solitary, up to $\frac{1}{6}$ in. long, oblong, acute, glabrous.

Viti Levu: Lautoka, on mud flats near mouths of small creeks and edges of mangroves, Feb., *Greenwood*, 227! Vanua Levu: Mathuata Coast, common on mud flats, July, *Greenwood*, 227 A!

A littoral species, covering acres of land behind mangroves.

Common throughout tropics of both hemispheres.

P. orbiculare *Forst.* Prodr. 7. *P. scrobiculatum* L. var. Seem. Fl. Vit. 326.

Perennial. Culms 1–2 ft. or more high, erect or ascending from a short rhizome. Leaf-sheaths loose, slightly compressed below; blades narrowly lanceolate, up to 9 in. long, $\frac{5}{1\frac{1}{2}}$ in. wide, upper shorter and narrower, soft to rigid, glabrous or slightly hairy, margins rough. Racemes 2–5, scattered, $\frac{3}{4}$–2$\frac{1}{2}$ in. long, rhachis $\frac{1}{2\frac{1}{4}}$–$\frac{1}{1\frac{1}{6}}$ in. wide. Spikelets in 2 rows, solitary, orbicular, $\frac{1}{1\frac{1}{2}}$ in. long, rounded at apex, glabrous, brownish.

Viti Levu: Lautoka, common on open hillsides, mostly in damp places, Dec., *Greenwood*, 181! Vanua Levu: Lambasa, only a few patches seen, June, *Greenwood*, 597! Ngau: Sept., *Macgillivray*! (Herb. Mus. Brit.). ? Ovalau: *Seemann*, 682! (Herb. Mus. Brit.). Lakemba: Nov., *Harvey*! (Herb. Mus. Brit.).

Tropical Asia, Malaya and Polynesia.

P. dilatatum *Poir.* in Lamk. Encycl. v. 35.

Robust perennial. Culms erect from a stout rhizome, 1$\frac{1}{2}$–6 ft. high. Leaf-sheaths loose, slightly compressed; blades narrowly lanceolate, finely pointed, 8–24 in. long, $\frac{1}{6}$–$\frac{5}{8}$ in. wide; usually glabrous, margins rough. Racemes 4–5, distant, 2–4 in. long;

rhachis $\frac{1}{16}$ in. wide. Spikelets in 4 rows, paired, $\frac{1}{8}$ in. long, elliptic-ovate, acute, hairy, pale green.

Viti Levu: Lautoka, common on sides of roads, etc., Jan., *Greenwood*, 204!

Native in South America; introduced into and much cultivated in many parts of the world.

Good fodder; cattle like it (Greenwood).

Vern. Name: "Dallis Grass".

21. Stenotaphrum Trin.

S. secundatum *O. Ktze.* Rev. Gen. Pl. ii. 794.

Perennial. Culms ascending from a long, creeping, leafy, rooting base, from a few inches to over 1 ft. high. Leaf-sheaths much compressed, keeled; blades narrow, 1–6 in. long, $\frac{1}{6}$–$\frac{3}{8}$ in. wide, glabrous, folded or flat, blunt or rounded. Spikelets alike, awnless, falling entire, sessile, solitary or 2–5 together on a short secondary axis, and more or less sunken in or closely adpressed to the hollows on one side of a flattened stout rhachis $\frac{1}{8}$–$\frac{1}{3}$ in. wide and up to $\frac{1}{8}$ in. thick, forming a spike 1–4 in. long. Spikelets lanceolate-oblong to oblong, acute, $\frac{1}{5}$ in. long, 2-flowered, upper floret alone perfect.

Viti Levu: Suva, sea level, May, *Greenwood*, 641!

Tropical and South Africa, America, Australia and Polynesia.

An excellent pasture grass; also used for making coarse lawns. Said to be a nuisance in plantations in some parts of Fiji.

Vern. Names: "Buffalo Grass" (*Greenwood*). "St. Augustine Grass" (In America).

S. subulatum *Trin.* in Mém. Acad. St. Pétersb. Sér. vi. Sci. Nat. iii. 190.

Differing from *S. secundatum* by the following:—Annual or perennial. Culms tufted, erect or ascending from a short creeping base, up to 18 in. high. Leaf-sheaths slightly compressed, loose; blades lanceolate, finely pointed, 1–5 in. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide, flat. Spikes slender, cylindrical, 1–6 in. long; rhachis $\frac{1}{16}$–$\frac{1}{12}$ in. wide. Spikelets 2–4 together, sunken in the cavities on the rhachis, oblong to oblong-lanceolate, obtuse, $\frac{1}{10}$–$\frac{1}{8}$ in. long.

Namena (Direction Island): *Wilkes*! Tutinella*: *Wilkes*!

Polynesia.

22. Urochloa Beauv.

U. reptans *Stapf* in Prain Fl. Trop. Afr. ix. 601. *Panicum reptans* Linn. Syst. Nat. ed. x. 870.

Annual. Culms ascending from a prostrate or creeping base, 6–18 in. high, many-jointed. Leaf-blades lanceolate to broadly lanceolate, $\frac{1}{2}$–$2\frac{1}{2}$ in. long, $\frac{1}{5}$–$\frac{1}{2}$ in. wide, rounded or heart-shaped at

* We can find no locality of this name in the Islands.

the base, glabrous or hairy on the margins. Spikelets alike, solitary, paired or clustered, shortly stalked, on one side of and with the upper glume adjacent to the 3-angled rhachis of 8–12 crowded, spike-like racemes $\frac{1}{2}$–$1\frac{1}{4}$ in. long, forming a panicle 1–3 in. long. Spikelets elliptic-oblong, $\frac{1}{16}$–$\frac{1}{12}$ in. long, awnless, falling entire, 2-flowered, upper floret alone perfect.

Viti Levu: Lautoka, *Greenwood*, 328! Dec., Jan., *Greenwood*, 414! Vanua Levu: Lambasa, sea level, Sept., *Greenwood* 414 A!

Tropical and Subtropical Africa and America, Indo-Malaya, Australia and Polynesia.

Considered in India to be good fodder for cattle.

U. paspaloides *Presl* Rel. Haenk. i. 318. *Panicum ambiguum* Trin. in Mém. Acad. St. Pétersb. Sér. vi. Sci. Nat. iii. 243.

Differing from *U. reptans* by the following:—Annual. Culms erect or ascending, 9–24 in. high. Leaf-blades narrow, 3–9 in. long, $\frac{1}{6}$–$\frac{1}{3}$ in. wide, scarcely rounded at the base, hairy, margins rough. Panicle 2–6 in. long; racemes 3–6, rarely more, 1–$2\frac{1}{2}$ in. long, scattered. Spikelets oblong-lanceolate, $\frac{1}{8}$–$\frac{1}{6}$ in. long.

Viti Levu: Lautoka, common at sea level, July, *Greenwood*, 593 A! Vanua Levu: Lambasa, common at sides of roads, and other fairly dry places, May, *Greenwood*, 593! Without exact locality: *Wilkes*!

India, Malaya, Mascarene Is. and Polynesia.

23. Echinochloa Beauv.

E. colona *Link* Hort. Berol. ii. 209. *Panicum colonum* Linn. Syst. Veg. ed. x. 870; Rendle in Journ. Linn.Soc. Bot. xxxix. 182.

Tufted annual. Culms slender, up to 2 ft. high. Leaves glabrous; ligule none; blades narrow, 3–12 in. long, $\frac{1}{6}$–$\frac{1}{4}$ in. wide, flat. Spikelets alike, falling entire, paired and crowded on one side of and with the upper glume adjacent to the 3-angled rhachis of usually more than 6 scattered, erect or slightly spreading spike-like racemes which are $\frac{1}{4}$–1 in. long, forming a narrow, erect panicle, 2–5 in. long. Spikelets 2-flowered, upper floret alone perfect, ovate, $\frac{1}{10}$–$\frac{1}{8}$ in. long, awnless, greenish or tinged with purple.

Viti Levu: Lautoka, common on low land, June, *Greenwood*, 31! Nandarivatu, on road to Waikobakoba, in bog at 2500 ft. Sept., *Gibbs*, 694! In bush near Botanical Station, Febr., *Yeoward*!

Widely spread throughout the Tropics and warm temperate regions of the world.

Considered a good fodder grass in India, and commonly met with as a weed on cultivated ground.

24. Oplismenus Beauv.

Spikelets alike, awned from the slightly notched tips of the glumes, 2-flowered, upper floret alone perfect, falling entire at maturity from their stalks, on one side of the angular rhachis of scattered spike-like racemes.

O. hirtellus *Beauv.* Agrost. 54, 168.

Perennial. Culms slender, often several feet long. Leaf-blades lanceolate, finely pointed, rounded at the base, 1½–5 in. long, ⅙–¾ in. wide, thin, soft to rigid. Racemes 3–9, distant by more than their own length. Spikelets contiguous, ⅛–⅙ in. long; awns 1½–½ in. long.

Nairai: Waste ground on mountains, Nov., *Milne*, 165!

Tropical and South Africa, Mascarene Is., Tropical and Subtropical America and Polynesia.

O. compositus *Beauv.* Agrost. 54.

Perennial. Vegetative characters of *O. hirtellus*, but more robust. Racemes up to 10 or more, overlapping. Spikelets loose, ⅛–⅙ in. long; awns 1½–⅔ in. long.

Viti Levu: Mt. Evans, near falls, about 2000 ft., May, *Greenwood*, 222!

Tropical Africa, Tropical and Subtropical Asia, Australia and Polynesia.

O. imbecillis *Roem. & Schult.* Syst. Veg. ii. 487. *O. compositus* Seem. Fl. Vit. 324.

Perennial. Culms very slender. Leaf-blades narrowly lanceolate, up to 2½ in. long, ⅙–⅕ in. wide. Racemes reduced to sessile clusters. Spikelets about ⅛ in. long; awns 1½–¼ in. long.

Taveuni: June, *Seemann*, 681! Two sterile specimens (*Seemann* 679 and 680) referred by Seemann erroneously to *O. Burmanni* Beauv. probably belong here, as they agree in vegetative characters.

Australia and Polynesia.

25. Panicum Linn.

P. maximum *Jacq.* Ic. i. 2. t. 13.

Densely tufted perennial. Culms to over 10 ft. high. Leaves glabrous or hairy; blades narrow, 6–24 in. long, ⅙–1 in. wide, margins rough. Spikelets alike, symmetrical, awnless, falling entire from their stalks, on the branches and branchlets of a dense to moderately loose panicle 6–18 in. long. Spikelets oblong, blunt, ⅛–⅙ in. long, 2-flowered, florets dissimilar, upper alone perfect. Lemma of upper floret firmer in texture than the glumes.

Viti Levu: Lautoka, common along drains, roads and waste lands, Jan., *Greenwood*, 195! Also right around coast from Penang to Singatoka (Greenwood).

Native in Tropical and South Africa and Mascarene Is; introduced and widely spread in India, America, etc.

It is one of the best fodder grasses in the Tropics.

Vern. Name: "Guinea Grass".

P. decompositum *R. Br.* Prod. 191. *P. amabile* Bal. in Bull. Soc. Bot. Fr. xix. 324.

Differing from *P. maximum* by the following:—Tufted perennial. Culms 2–4 ft. high. Leaves glabrous; blades narrow, 6–18 in. long, $\frac{1}{4}$–$\frac{1}{2}$ in. wide, margins smooth. Panicle 6–18 in. long, very loose. Spikelets lanceolate, sharply pointed, $\frac{1}{12}$–$\frac{1}{8}$ in. long.

Viti Levu: Singatoka Railway, past Na Savusavu, on sides of cuttings, Apr., *Greenwood*, 245! Wakaya; waste places, not frequent, Oct., *Milne*, 394! (*Macgillivray*, Herb. Mus. Brit.).

Australia and New Caledonia.

Used for fodder in Australia.

26. Cyrtococcum Stapf.

C. oxyphyllum *Stapf* in Hook. Ic. Pl. t. 3096. *Panicum oxyphyllum* Hochst. ex Steud. Syn. 65. *P. trigonum* Seem. Fl. Vit. 325, non Retz.

Weak perennial grass. Culms ascending from a slender, creeping base, up to 2 ft. long, many-jointed. Leaf-blades lanceolate, 1$\frac{1}{2}$–4$\frac{1}{2}$ in. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide, nearly glabrous above, shortly hairy beneath. Spikelets alike, asymmetrical, obliquely obovate, compressed, awnless, falling entire from their stalks, on the branches of dense, narrow panicles 1$\frac{1}{2}$–4$\frac{1}{2}$ in. long. Spikelets $\frac{1}{16}$–$\frac{1}{12}$ in. long, brownish, 2-flowered, upper floret alone perfect.

Viti Levu: Natova, near Lautoka, in shade of trees just behind mangrove formation, May, *Greenwood*, 165! Namara, *Seemann*, 693! Waste places, Dec., *Milne*, 181! Vanua Levu: Lambasa, on mountains on lower slopes in forest clearings, July, *Greenwood*, 165 A! Ngau: Sept., *Macgillivray*! (Herb. Mus. Brit.). Without definite locality: *Wilkes*! Also on Ovalau according to Seemann.

Indo-Malaya, Australia and Polynesia.

27. Setaria Beauv.

S. glauca *Beauv.* Agrost. 51.

Loosely tufted annual. Culms slender, 1–2 ft. high. Leaf-blades narrow, 2–12 in. long, $\frac{1}{6}$–$\frac{1}{3}$ in. wide, flat, usually glabrous. Spikelets alike, awnless, each supported by 6–8 persistent bristles, falling entire from their very short stalks, on the axis of an erect, dense, cylindrical, golden-brown spike up to 3 in. long, $\frac{1}{2}$–$\frac{2}{3}$ in. wide. Spikelets $\frac{1}{8}$ in. long, 2-flowered, upper floret alone perfect; bristles $\frac{1}{4}$–$\frac{1}{3}$ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 18!

Occurs in all warm-temperate and tropical regions.

Usually a weed of cultivated ground.

28. Rhynchelythrum Nees.

R. Dregeanum *Nees* in Lindl. Introd. Nat. Syst. ed. ii. 447. *Tricholaena Dregeana* Dur. & Schinz Consp. Fl. Afr. v. 769.

Loosely tufted annual. Culms slender, 1–3 ft. high. Leaves glabrous or hairy; blades narrow, 2–8 in. long, $\frac{1}{12}$–$\frac{1}{4}$ in. wide.

Spikelets alike, awned or awnless, laterally compressed, falling entire from their stalks, on an oblong to pyramidal, loose panicle 3–6 in. long; stalks very fine, with fine silky hairs from beneath their tips. Spikelets oblong, bulging on the sides, gaping, $\frac{1}{8}$ in. long, covered with long pinkish hairs, 2-flowered, upper floret alone perfect.

Viti Levu: Lautoka, 600 ft., Jan., *Greenwood*, 171! Common on hills behind Lautoka up to 800 ft. and also in wet places on estates near the sea.

Tropical and South Africa.

Cultivated in many parts of the world as a fodder grass.

Vern. Names: "Red Top Grass," "Natal Grass."

29. Cenchrus Linn.

C. calyculatus *Cav.* Ic. v. 39. t. 463. *C. anomoplexis* Labill. Sert. Austr. Cal. 14. t. 19; Seem. Fl. Vit. 324.

Erect or spreading annual. Culms over 18 in. high, stout. Leaves glabrous; blades narrowly lanceolate, 9–18 (rarely only 4) in. long, $\frac{1}{3}$–$\frac{3}{4}$ in. wide, finely pointed. Spikelets alike, awnless, in clusters, each cluster surrounded by hard spines joined at the base into a hard cup bearing erect or spreading bristles, falling at maturity with the spines and bristles from the axis of spike-like racemes 3–10 in. long; stalks of clusters $\frac{1}{12}$ in. long, spines all slender, innermost densely hairy.

Vanua Levu: Mathuata Coast, on coast along railway embankments, rare, Apr., *Greenwood*, 664! Taveuni: June, *Seemann*, 688! Nairai: waste places, plentiful, Nov., *Milne* 163! Wakaya: waste places, frequent, Oct., *Milne*, 378! Without definite locality: *Horne*! Seemann's specimen is quoted by him in Flora Vitiensis as Ovalau but the specimen at Kew is labelled Vuna, which is the old name for Taveuni. Also on Viti Levu according to Greenwood, but rare.

New Zealand and Polynesia.

C. echinatus *Linn.* Sp. Pl. ed. i. 1050.

Differing from *C. calyculatus* by the following:—Culms 1–2 ft. high. Leaves hairy or glabrous; blades narrow, 3–9 in. long, $\frac{1}{6}$–$\frac{1}{2}$ in. wide. Spikes 1–3 in. long; clusters nearly sessile; inner spines much broadened at the base, sparsely hairy.

Viti Levu: Lautoka, very common, March, *Greenwood*, 60!

Native of America, introduced elsewhere.

A troublesome weed. The burrs do considerable damage by getting entangled in the fleeces of sheep.

Vern. Name: "Burr Grass."

30. Thuarea Pers.

T. involuta *Kunth* Enum. i. 174. *T. sarmentosa* Pers. Syn. i. 110. *Ischaemum involutum* Forst. Prod. 73.

Perennial. Culms prostrate, creeping, much branched. Leaf-

blades narrow to narrowly lanceolate, 1–5 in. long, $\frac{1}{6}$–$\frac{1}{3}$ in. wide, glabrous or silky. Spikelets awnless, falling entire, in one row on one side of a flattened axis, forming a terminal spike $\frac{1}{2}$–1 in. long. Spikelets $\frac{1}{8}$–$\frac{1}{6}$ in. long, the lower 1–2 spikelets female or perfect, the upper 4–6 male. Grain closely enveloped in the thickened, widened base of the spike-axis forming a hardened fruit $\frac{1}{3}$ in. long, with a deflexed beak.

Viti Levu: Singatoka, creeping on sands near the sea, May, *Greenwood*, 271! Without definite locality: *Wilkes*! According to Seemann „collected on the Mathuata Coast of Vanua Levu and on Oneata by Wilkes.

Coasts of Indo-Malaya, Madagascar, Australia and Polynesia.

31. Isachne R. Br.

I. vitiensis *Rendle* in Journ. Linn. Soc. Bot. xxxix. 181.

Perennial. Culms up to 3 ft. high. Leaf-blades narrowly lanceolate, 3–8 in. long, $\frac{1}{4}$–$\frac{3}{4}$ in. wide, rigid, slightly rough on both sides and on the thickened margins. Spikelets alike, ovoid, $\frac{1}{16}$ in. long, 2-flowered, florets similar, falling in parts from very short stalks, on the branches of an erect panicle 3–8 in. long, $1\frac{1}{2}$–$3\frac{1}{2}$ in. wide.

Viti Levu: Col i Nandarivatu, about 3100 ft., Sept., *Gibbs*, 815! (Herb. Mus. Brit.). Mt. Evans, about 3000 ft., at side of streams in open sunny places, June, *Greenwood*, 326! Woody places on mountains, *Milne*, 25!

Restricted to Fiji.

32. Oryza Linn.

O. sativa *Linn.* Sp. Pl. ed. i. 333.

Annual. Culms 2–10 ft. long, creeping or floating. Leaf-blades 1–2 ft. long, $\frac{1}{4}$–$\frac{1}{2}$ in. wide, rough. Spikelets alike, falling entire from the branches of a loose panicle, one-flowered, oblong, much compressed, awned or awnless, $\frac{1}{4}$–$\frac{1}{2}$ in. long. Glumes minute, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the hardened lemma.

Viti Levu: Lautoka, in drains and other wet places, June, *Greenwood*, 303!

Native in India, cultivated generally in tropical and subtropical regions.

Escape from cultivation in Fiji. Grown very largely by Indians for food.

Vern. Name: "Rice".

33. Leptaspis R. Br.

L. angustifolia *Summerhayes & Hubbard* in Kew Bull. 1927.

Densely tufted perennial. Leaf-blades erect or slightly spreading, more or less rigid, narrow, 9–18 in. long, $\frac{1}{6}$–$\frac{1}{3}$ in. wide, sharply pointed, rough on both sides, finely veined with cross-nerves:

petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long. Spikelets unisexual, 1-flowered, in very narrow, erect panicles 4–5½ in. long. Male spikelets with brown, ovate, spreading glumes and 6 stamens; female spikelets with glumes similar to those of the male spikelets; lemma sack-like, inflated.

Vanua Levu: Lambasa, about 300 ft., Oct., *Greenwood*, 550! In mountains at about 1200 ft., Oct., *Greenwood*, 548! In clumps in thick forest.

Restricted to Fiji.

34. Garnotia Brongn.

G. stricta *Brongn.* in Duperr. Voy. Bot. 133. t. 21.

Annual, sometimes perennial. Culms slender, ascending, 1–3 ft. long, branched, many-jointed. Leaf-blades narrowly lanceolate. Spikelets alike, falling entire from the branches of a very narrow, straight or wavy panicle 2–10 in. long, one-flowered, narrowly lanceolate, $\frac{1}{8}$–$\frac{1}{6}$ in. long; lemma awned, rarely awnless, awns up to $\frac{1}{2}$ in. long.

Viti Levu: Mt. Evans, near Lautoka, on rocks in spray of waterfall, Apr., *Greenwood*, 225! Mt. Evans, on steep cliff-face in shade, about 3600 ft., Apr., *Greenwood*, 443! (An awnless form). Vanua Levu: Lambasa, on mountains in open forest, 1200 ft., Oct., *Greenwood*, 549! Lagu/Lagu Mts., in shade in forest, July, *Greenwood*, 549 A!

Tropical Asia, Malaya and Polynesia.

The specimens are very variable, only the last two cited being typical. The others may possibly represent distinct species but seem more probably to be habitat forms.

35. Sporobolus R.Br.

S. indicus *R. Br.* Prod. 170.

Tufted perennial. Culms erect, 1½–3 ft. high. Leaf-blades very narrow. Spikelets alike, one-flowered, breaking up at maturity leaving the glumes on the stalks, on the erect or very slightly spreading branches of dense, very narrow panicles 5–18 in. long; branches with spikelets right to the base. Spikelets lanceolate, $\frac{1}{16}$–$\frac{1}{12}$ in. long, olive-green, awnless; glumes and lemma membranous.

Vanua Levu: Lambasa, in clumps in dry places by sides of roads, Nov., *Greenwood*, 560! Oct., *Greenwood*, 560 A!

All warm countries.

S. diander *Beauv.* Agrost. 26.

Differing from *S. indicus* by the following: - Culms 1–3 ft. high, more slender. Panicle rather loose, 4–10 in. long; branches spreading, especially in fruit, naked at the base. Spikelets $\frac{1}{20}$–$\frac{1}{16}$ in. long.

Viti Levu: Suva, fairly common by sides of roads, etc., Jan., *Greenwood*, 577!

Tropical Asia and Australia.

E. pilosa *Beauv.* Agrost. 71.

Annual. Culms 3 in. to 3 ft. high, slender to very slender. Leaf-blades short and narrow, mouth of sheath bearded. Spikelets alike, 5–12 flowered, awnless, breaking up at maturity leaving the glumes on their stalks, on the wavy, very long, threadlike branches of erect or nodding, flexuous, very loose panicles of variable size. Spikelets narrow, up to $\frac{1}{5}$ in. long, glabrous; glumes and lemmas membranous, the latter less than $\frac{1}{18}$ in. long and 3-nerved.

Viti Levu: Lautoka, Apr., *Greenwood*, 2! Sept., *Greenwood*, 92! On poor, dry, gravelly ridges, March, *Greenwood*, 139!

In Southern Europe and most warm parts of the world.

E. plumosa *Link* Enum. Hort. Berol. i. 192.

Differing from *E. pilosa* in the following:—Culms 6–18 in. high, slender. Mouth of leaf-sheath slightly bearded. Panicle erect, rather rigid, closely branched, 2–8 in. long; branches short. Spikelets ovate-oblong to oblong, $\frac{1}{25}$–$\frac{1}{6}$ in. long, 3–9 flowered; lemmas less than $\frac{1}{24}$ in. long; palea with softly hairy keels.

Viti Levu: Lautoka, Apr., *Greenwood*, 3! Singatoka, Cuvu, on sandy soils, Sept., *Greenwood*, 65! Vanua Levu: Lambasa, on damp ground in shade under trees, sea level, Apr., *Greenwood*, 663!

Tropical Africa, Asia and America.

37. Cynodon Pers.

C. Dactylon *Pers.* Syn. i. 85.

Creeping perennial. Culms from a few inches to over 1 ft. high, many-jointed. Leaves short, crowded at the base of the plant; sheaths overlapping on the barren shoots, compressed; blades narrow. Spikelets alike, breaking up at maturity leaving the glumes or glume, overlapping in two rows, on one side of the slender, keeled rhachis of 2–6 straight or curved spikes $\frac{1}{2}$–$2\frac{1}{2}$ in. long, clustered at the apex of the culm. Spikelets about $\frac{1}{12}$ in. long, one-flowered, awnless; glumes and lemma membranous.

Viti Levu: Lautoka, very common, Feb., *Greenwood*, 265!

All warm countries.

Good lawn grass if cut well and watered regularly (Greenwood). Cultivated in some parts of the world for hay.

Vern. Names: "Bermuda Grass," "Couch Grass."

38. Chloris Swartz.

C. truncata *R. Br.* Prod. 186.

Tufted perennial. Culms 1–3 ft. high, erect. Leaf-sheaths much flattened; blades narrow, blunt. Spikelets alike, breaking up at maturity leaving the glumes, overlapping in two rows on one side of the slender rhachis of 6–10, erect or spreading spikes 3–6 in. long, clustered at the apex of the culm. Spikelets wedge-

shaped, the widest part above, $\frac{1}{12}$–$\frac{1}{8}$ in. long, black at maturity, 2-flowered, lower perfect, awned; awn $\frac{1}{4}$–$\frac{1}{2}$ in. long.

Without definite locality: *Horne*, 381!

Australia.

C. cynodontoides *Bal.* in Bull. Soc. Bot. Fr. xix. 318.

Differing from *C. truncata* by the following:—Creeping perennial. Culms up to 15 in. high. Leaf-sheaths flattened. Spikes 3–6, 1$\frac{1}{2}$–4 in. long. Spikelets narrowly oblong, $\frac{1}{8}$ in. long, pale; awn $\frac{1}{4}$–$\frac{1}{3}$ in. long

Viti Levu: Singatoka, Cuvu, on railway line, near sea, Oct., *Greenwood*, 226! Suva, Apr., *Greenwood*, 226 A!

New Caledonia.

39. Eleusine Gaertn.

E. indica *Gaertn.* Fruct. i. 8.

Annual. Culms erect, from a few inches to 2 ft. high, slender to stout. Leaves crowded near the base, usually glabrous; sheaths compressed, pale; blades narrow, 6 in. to over 1 ft. long, $\frac{1}{8}$–$\frac{1}{4}$ in. wide. Spikelets alike, breaking up at maturity leaving the glumes, overlapping in two rows on one side of the flattened rhachis of 2–14 straight spikes 1–7 in. long, clustered at the apex of the culm or with one or two $\frac{1}{4}$–3 in. below it. Spikelets $\frac{1}{8}$–$\frac{1}{6}$ in. long, 3–6-flowered, awnless, greenish.

Viti Levu: Lautoka, common, Jan., *Greenwood*, 162! Ovalau: Oct., *Milne*, 276! Ngau: Sept., *Milne*, 172! *Macgillivray*! (Herb. Mus. Brit.). Wakaya: Oct., *Milne*, 395! Without exact locality: *Horne*! (Herb. Mus. Brit.); *Seemann*, 690! (Herb. Mus. Brit.).

Native in the tropics of the Old World, introduced into the New.

Used in some parts of the world for fodder, but is generally regarded as a troublesome weed.

Vern. Name: "Crowfoot Grass" (Fiji).

40. Centotheca Desv.

C. latifolia *Trin.* Fund. Agrost. 141. *C. lappacea* Desv. in N. Bull. Soc. Phil. ii. 189; Seem. Fl. Vit. 322; Rendle in Journ. Linn. Soc. Bot. xxxix. 182.

Perennial. Culms 1–4 ft. high. Leaf-blades broadly lanceolate, 4–10 in. long, $\frac{3}{4}$–1$\frac{1}{4}$ in. wide. Spikelets alike, 1–3-flowered (lowest perfect), awnless, breaking up at maturity leaving the glumes, shortly stalked, on the long simple branches of an open, broad, lax panicle 3–10 in. long. Spikelets ovate-oblong, $\frac{1}{8}$–$\frac{1}{4}$ in. long, green; lemmas 5–7-nerved, usually with erect, at length deflexed spines above the middle.

Viti Levu: Lautoka, Dec., *Greenwood*, 4! Near mouth of Wai ni Mala, in shady woods, *Horne*, 107! Nov., *Milne*, 419! Nandarivatu, carpeting forest, 2700 ft., Sept., *Gibbs*, 614! (Herb. Mus. Brit.). Ovalau: Oct., *Milne*, 275! Shady places in mountains, *Horne*, 60! Nairai: In woods, Nov., *Milne*, 162!

Wakaya: July, *Milne*, 412! Oct., *Milne*, 400! Ngau: Sept., *Milne and Macgillivray*, 171! Moala: Sept., *Milne*, 132! Naviti: woody places, Dec., *Milne*, 182! Without definite locality: *Seemann*, 684! *Horne*! (both Herb. Mus. Brit.).

Tropical Asia, Africa and Polynesia.

41. Lepturus R.Br.

L. repens R.Br. Prodr. 207.

Creeping perennial. Leaf-blades narrow, 3–6 in. long, $\frac{1}{8}$–$\frac{1}{4}$ in. wide, glaucous. Spikelets solitary, 1–2-flowered (lower perfect), half immersed in the hollows in the rhachis of a solitary, terminal, jointed, straight, erect spike 2–6 in. long. Spikelets $\frac{1}{4}$–$\frac{1}{2}$ in. long; upper glume longer than the joints of the rhachis, rigid, finely pointed.

Viti Levu: Along coast from Lautoka to Ba, in sand, May, *Greenwood*, 224! Vanua Levu: Mathuata Coast, creeping on ground just above high water mark, July, *Greenwood*, 224 A! Without definite locality: *Wilkes*!

Ceylon, Malaya, Australia and Polynesia.

We have three specimens of Bamboos but in the absence of flowers the determinations remain doubtful.

Schizostachyum glaucifolium Munro in Trans. Linn. Soc. xxvi. 137. Seem. Fl. Vit. 323.

Viti Levu: near banks of rivers, *Seemann*, 694! Uvea, (? Uea) *Graeffe*, 49!

Polynesia.

Vern. Name: Bitu.

Bambusa sp. A plant with smaller and differently shaped leaves.

Viti Levu: Lautoka, in mountains, in forest near water, tall plant up to 60 ft. high, May, *Greenwood*, 278!

Planted near tracks by the natives.

Doubtful Species.

Olyra sp. *O. micrantha* H.B.K. according to Seemann Fl. Vit. 326. We can find no specimen of *Olyra* from Fiji either at Kew or at the British Museum. According to Mrs. Chase*, Wilkes's specimen from Sandalwood Bay (Vanua Levu) is "a form distantly related to *O. micrantha* H.B.K." As however, with the exception of the African *O. latifolia* L., which belongs to a different section of the genus, the genus is entirely American, it seems probable that Wilkes's specimen is wrongly ascribed to Fiji, especially as the U.S. Exploring Expedition touched at several places in South America.

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* Proc. Biol. Soc. Washington xxi. 177, 178.

V.—THE GARDEN OF H.H. THE PRINCE OF MONACO.

W. Taylor.

At the desire of the Director I spent a fortnight in September last in visiting some of the more interesting gardens in the South of France and Northern Italy. Among them is the garden belonging to H.H. the Prince of Monaco, which, perhaps, is the most wonderful on the Riviera for its collection of Cacti and succulents. Jutting out into the Mediterranean about a couple of miles from Monte Carlo and backed by mountain ranges of moderate height is the principality of Monaco. Here a precipitous mass of rock has been transformed into a garden paradise, and, as the Prince spares neither money nor pains to secure the best, his garden is becoming famous throughout Europe. Monaco is truly a garden of Cacti and Succulent plants; the collection is remarkably rich in its number of species, and their condition is most satisfactory. I have never seen plants so luxuriant and perfect as they are in this garden. I did not detect a plant which had a blemish of any kind upon its stem or branches.

On this steep rocky slope a series of winding paths and short flights of steps give easy access to all parts of the garden. Much judgment has been exercised in both the planting and grouping of the different genera.

A list of all the plants in the garden would be longer than space will permit. One of the most imposing features is a group of *Echinocactus Grusonii*. The plants resemble huge cushions, several of them being at least two feet in diameter, and if it were not for their stiff spines, one would be tempted to sit on them. Among the many giants of the place is a plant of *Cereus peruvianus* var. *monstrosus* which is over 20 feet high and at the time of my visit was bearing a quantity of large red fruits. *Cereus scoparius* with its tall columnar stem reminds one of the Giant Cactus (*C. giganteus*). *C. Houlletii* is 10 feet high, whilst *C. smaragdinus*, with stems resembling huge snakes, was trailing over the rocks. A magnificent plant of *C. validus* is seen towering to a height of 20 feet or more, while *C. marginatus* and *C. gemmatus* are about 10 feet high. Good specimens of *Opuntia* include *O. senilis*, which is remarkable in having long white "hairs" on the young branches. *O. subulata* is very distinct in having its branches almost cylindrical. A very fine specimen of *O. tomentosa* is 15 feet high and nearly as much in diameter. *O. tunicata* is represented by a large clump of this very spiny species. Euphorbias of the candelabra type are represented by some very large specimens ranging in height from 10 to 25 feet, and include such species as *E. abyssinica*, *E. alcicorne*, *E. grandicornis* and *E. grandidens*.

Among Aloes the tree-like *A. Bainesii* was most conspicuous, the largest specimen being about 12 feet high and branched into four good heads. There are several species of *Agave*, the most noteworthy being *A. Victoria-Reginae*—one plant in flower had a stem

12 feet high. Crassulas, Haworthias, Mesembryanthemums and many more equally notable succulent plants are quite at home and look very happy in this most interesting garden.

VI.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies: Mr. J. R. V. Smyth, Mr. E. T. Holmes, Mr. I. E. James, B.Sc., and Mr. B. C. Owen, B.A., to be Superintendents of Agriculture, Nigeria; Mr. J. C. Haigh, B.Sc., A.R.C.S., Assistant Mycologist, Ceylon.

Vegetable Hair.—From enquiries recently received at Kew interest would appear to exist in certain quarters on the subject of "Vegetable Hair," a product of the Dwarf Fan Palm.

The Dwarf Fan Palm (*Chamaerops humilis L.*) is common in certain regions in South Europe and North Africa, particularly Algeria and Tunis, and is the only palm actually indigenous to Europe. In Algeria it was once regarded as a scourge on account of its deep tough roots, difficult to extirpate, and an obstacle to cultivation.

The leaves, and the fibre from the leaves and petioles, are used in the manufacture of baskets and rope, and various other articles, such as brooms, brushes, hats, etc., whilst the fibrous brown leaf-sheaths are used for mat-making.

The most interesting economic product of this palm is, however, the "Vegetable Fibre," or "Vegetable Hair" ("Crin Végétal"), of commerce. The fibre obtained from the leaves has a crinkled appearance, owing to a process of twisting it is put through in manufacture. It is frequently dyed black and is used as a substitute for horse-hair in upholstery, being very resilient and rather resistant to insect attack.

The principal countries of export of "Vegetable Hair" are Algeria and Tunis, the former country exporting over 40,000 tons (metric) in 1923. The bulk of this export goes to the United States and Italy, though Great Britain, Germany, France, Holland and Belgium are also importers. A very similar product is prepared from the "Saw Palmetto" (*Serenoa serrulata* Hook. f.) of the S. United States.

F. N. H.

Kava.—The following note has been received from Mr. N. Rowe, who has recently returned from Samoa.

Kava is a drink well known throughout the greater part of Polynesia. Its preparation by the admixture of water with the pulverised root of the kava tree *Piper methysticum* is always attended by much ceremony.

In former days the kava root having been cut in small pieces was handed to chew to young women, chosen for their good teeth

and prepossessing appearance (see *K.B.* 1887, p. 8). The kava thus treated was placed in a wooden bowl and water poured upon it. The girl in charge of the kava bowl then put in the Fow—a bundle of very narrow strips of bark resembling a bundle of garden raffia. With this she kneaded together the kava and water until the liquid had acquired the right consistency. She then got rid of the liquid from the residue by straining the Fow through it and then swinging and flacking the Fow above her head. The kava, an opaque yellow liquid, was then ready for drinking. Nowadays the kava is pounded between stones instead of being chewed; this apparently being a concession to the peculiar prejudices of the white man.

Kava must be freshly made, as in a few hours it becomes stale. The drink is cooling and well suited to a hot climate. It is a stimulant and induces an immediate craving for tobacco. To the novice kava has a flavour resembling soapy water, but as it figures so much in the ceremonial of the islands the resident must drink it and the taste is soon acquired.

Any quantity of kava prepared from the dry root of the kava tree can be drunk without fear of intoxication. Kava made from the green kava root may, however, induce temporary and partial paralysis of the legs.

Winter Blossoms from the Outdoor Garden.*—This attractive book is intended as a guide for those who wish to have flowers in their gardens during the winter months. The author begins with a chapter on the various methods adopted for propagating plants. Then follows an alphabetical list of shrubs and border plants that flower at this time of year. Many are well-known garden plants that may be relied on to produce flowers during the winter, but a number of doubtful ones are also included in the list. The chief genera dealt with are *Anemone*, *Crocus*, *Galanthus*, *Erica*, *Colchicum*, *Helleborus*, *Hamamelis*, *Rhododendron* and *Saxifraga*. Each plant is fully described and cultural hints are given. The book is well illustrated with twenty-four plates, of which six are coloured. It will prove a handy work of reference for the amateur who wishes his garden to be interesting during the winter months, but he may find that many bulbous plants mentioned are unobtainable, especially amongst the *Crocus* and *Colchicum*. W. I.

Science around the Pacific.†—The recently published report of the proceedings of the Pan-Pacific Science Congress (Australia) 1923 contains a wealth of papers on Agriculture, Forestry and Pure

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* By A. W. Darnell. L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, W.C.2, 1926. Pp. xxiv + 335, ill. 24. Price 21s.

† Proceedings of the Pan-Pacific Science Congress (Australia) 1923. Vol. 1. Edited by G. Lightfoot. Government Printer, Melbourne, Victoria, pp. xix + 1,024, numerous maps and text figs.

Botany as well as other branches of science from the various Pacific countries. Of the botanical Papers those on "The Evolution of the Genus Acacia" by R. H. Cambage, "The Sequoias of California, their Life-History and Geographical Distribution" by W. L. Jepson and Dr. W. H. van Leeuwen's paper entitled "On the present state of the Vegetation of the Islands of the Krakatau Group and of the Island of Sebesy" are of particular interest and serve to show the wide range of subject covered. The printing and arrangement are good, and many maps and diagrams are included.

The Flora of Kenya.*—An enumeration of the flora of each different country of tropical Africa is an important intermediate record between the first general survey contained in the Flora of Tropical Africa and the publication of regional floras such as the Flora of West Tropical Africa, now in the press. Mr. Battiscombe's list, although not exhaustive, contains over six hundred species and includes those most commonly encountered. The arrangement of the book is by Families on the system recently put forward by Hutchinson in his Families of Flowering Plants. With the botanical name of the species are given the vernacular names, a brief field description, the geographical distribution, and useful economic notes. The illustrations, which are well reproduced, depict types of forest vegetation, specimen trees, characteristic bark, flowers, etc. There are two Indices, one to the Botanical names and one to the Vernacular. This is the first publication to be devoted exclusively to the flora of Kenya.

Research and Crops.†—A valuable and interesting volume entitled " Research and the Land " has recently been issued by the Ministry of Agriculture and Fisheries. The work gives a summary of recent progress in the different branches of agricultural and horticultural research undertaken by the various Research institutions in the United Kingdom. The volume includes chapters on Soil Science, Plant Breeding, Growth, Nutrition, Intensive Culture, Preservation of Fruit, Entomology, Mycology and Plant Diseases generally, as well as many chapters on similar subjects connected with the animal side of Agriculture. Though the problems dealt with are primarily those concerning British crops, many fundamental principles are brought out which are of value to workers in all parts of the world.

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* A Descriptive Catalogue of some of the Common Trees and Woody Plants of Kenya Colony, by E. Battiscombe. The Crown Agents for the Colonies, 4, Millbank, Westminster, 1926. Pp. iii+142, plates 40. Price 10s.

† Research and the Land: an account of Recent Progress in Agricultural and Horticultural Science in the United Kingdom. By V. E. Wilkins. Pp. xiv, 388+xxxvi, 29 plates. London: H.M. Stationery Office, 1926. Paper, 2s. 6d. net; cloth, 3s. 6d. net.

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